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INDIA RUBBER WORLD

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Nomenclature of Synthetic Rubbers[1]

Harry L. Fisher[2]

SIXTY years ago synthetic indigo, a dream of organic chemists became a reality. Thirty years ago the increase in the knowledge of the chemistry of rubber made organic chemists dream also of synthesizing that important natural product. However rubber or, more specifically, the rubber hydrocarbon has not yet been synthesized[3] in spite of the tremendous amount of time and effort already expended on this intriguing problem. But in scientific journals, books, newspapers, and advertisements there is much that is published about "synthetic rubbers."

Indigo was synthesized, and there is no question about speaking of synthetic indigo. Since rubber has not been synthesized, why do we hear so much about synthetic rubbers? Are there any other names which could be used to describe the various "synthetic rubbers" and other rubber-like products? These are the questions which will be discussed in this paper.

Indigo is crystalline and can be purified easily; the rubber hydrocarbon can be crystallized only under very special conditions, cannot be distilled, and therefore is not easy to purify. Indigo has a comparatively low molecular weight which can easily be determined; the rubber hydrocarbon is an elastic polymer, the molecular weight of which is very high and cannot be determined with precision. A determination of the identity of the natural and synthetic samples of indigo can readily be made, but with rubber it is almost impossible with our present methods to show the absolute identity of two specimens, although it is possible for all practical purposes to do so.

History of Synthetic Rubber

As long ago as 1860 Williams[4] separated isoprene as a definite compound among the products of the destructive distillation of rubber. Fifteen years later Bouchardat[5] recognized the probable relation of isoprene to rubber and actually converted it to a rubber-like solid. In 1882 Tilden[6] discussed the possible industrial significance of the polymerizability of isoprene, provided it could be obtained commercially from a source other than natural rubber; in 1892 he reported[7] that isoprene which had been prepared from turpentine had spontaneously polymerized to a rubber-like product—he said "rubber." Early in the present century Kondakoff[8] found that 2,3-dimethylbutadiene, a homolog of isoprene, slowly polymerizes to a rubber-like product, and similar observations were made concerning piperylene or 1-methylbutadiene[9, 10] and butadiene itself.[11]

Commercial quantities of "synthetic rubber" were manufactured in Germany during the World War from 2,3-dimethylbutadiene; the product was known as methyl rubber.[12, 13]

There was a lull in synthetic rubber research until the rise in the price of rubber in 1925 furnished a stimulus to further work. In the present decade wonderful strides have been made, and now large quantities of "synthetic rubber" are being made from butadiene in Germany and Russia, and from a chloro derivative of butadiene (chloroprene) in this country. These "synthetic rubbers" are all prepared by processes of polymerization, and they bear a strong resemblance to natural rubber. They differ chemi-

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[1] Presented before the Division of Rubber Chemistry, A. C. S., at the Baltimore meeting, Apr. 3 to 7, 1939. Reprinted from *Ind. Eng. Chem.*, Aug., 1939, pp. 941-45.
[2] U. S. Industrial Alcohol Co., Stamford, Conn.
[3] Carothers, *Ind. Eng. Chem.*, 26, 30 (1934).
[4] C. G. Williams, *Trans. Roy. Soc. (London)*, 150, 241 (1860); *Proc. Roy. Soc. (London)*, 10, 516 (1860); *J. Chem. Soc.*, 15, 110 (1862).
[5] Bouchardat, *Compt. rend.*, 80, 1446 (1875), 89, 1117 (1879); *Bull. soc. chim.*, 24, 108 (1875).
[6] Tilden, *Chem. News*, 46, 120 (1882).
[7] *Ibid.*, 65, 265 (1892).
[8] Kondakoff, *J. prakt. Chem.*, 64, 109 (1901).
[9] Harries, "Untersuchungen über die natürlichen und künstlichen Kautschukarten" (1919).
[10] Thiele, *Ann.*, 319, 226 (1901); Bayer & Co., German patent No. 235,-686 (1909).
[11] Harries, *Ann.*, 383, 157 (1911); Lebedeff, *J. Russ. Phys. Chem. Soc.*, 42, 949 (1910); *Chem. Zentr.*, 1910, II, 1744.
[12] Gottlob, *India Rubber J.*, 58, 305, 348, 391, 433 (1919); "Technologie der Kautschukwaren," 2nd ed., p. 211, Brunswick, Germany, Friederich Vieweg & Sohn (1925); Whitby and Katz, *Ind. Eng. Chem.*, 25, 1204, 1338 (1933).
[13] Schotz, "Synthetic Rubber," London, Ernest Benn (1926).

cally from natural rubber, but most of them, especially the German Buna and the American Neoprene, have physical properties which in the vulcanized state make them superior to similar products from natural rubber; i. e., they are more resistant to the action of oils, fats, solvents, heat, air, sunlight, and, in some cases, abrasion.

There are also other synthetic rubber-like materials, and some of them are called "synthetic rubbers," although they are not related chemically to natural rubber or to the polymeric derivatives of butadiene: namely, methyl methacrylate rubber-like polymers, polyalkylene sulphides ("Thiokol"), polyisobutylenes (Vistanex, Oppanol), plasticized polyvinyl chloride (Koroseal), polystyrene above 65° C., polyvinyl acetate above 40° C., the inorganic rubber-like polyphosphonitrilic chloride, etc. They also must be classified.

All the synthetic substances so far mentioned have properties resembling rubber; they have been described in the literature not only as "synthetic rubbers," but also as "synthetic elastics," "rubber-like polymers," "rubber-like substances," "products with rubber-like properties," "plastic rubber-like materials," "rubbery polymers," etc. Rubber is also a plastic as well as an elastic substance and so are these other substances, but they all have these properties to different degrees.

The Term "Synthetic Rubber"

We can see, therefore, that the use of the term "synthetic rubber" has been widespread, although strictly speaking it is not properly used. However, when the situation is considered carefully, there does seem to be justification for it.

If a piece of "synthetic rubber" is handed to a man, he will note its similarity to natural or vulcanized rubber and quickly say, "That's rubber."

If it is not natural or vulcanized rubber, then what should it be called? It may be called a substitute rubber or properly an artificial rubber.

Harries,[9] who was one of the foremost workers in the field of synthetic rubber, wrote a book covering his researches, and he was careful at that time (1919) to use the German word *künstlichen* (artificial) rather than *synthetischen* (synthetic).

"Artificial" is a perfectly good word, but unfortunately it carries a connotation that is not always desirable. Artificial flowers, artificial light, artificial gems, and artificial teeth illustrate this point. Artificial means "produced or modified by human skill or labor, in opposition to natural." The building up of an artificial rubber or a substitute for rubber is so much like a regular chemical synthesis of a desired product that the term "synthetic rubber" appears to be a good and appropriate name.

It is of interest that a somewhat similar situation has arisen in the nomenclature of artificial fibers. The name "rayon" was given to fibers and threads made from viscose to replace the term "artificial silk." At present there are several kinds of rayon made from different cellulose derivatives, and similar fibers are made from casein and resinous products; the latter are also sometimes called "rayon." In other words, rayon has become the name of a type of fiber. Similarly "synthetic rubber" covers a type of material.

Houwink[14] gave the following broad definition of a rubber-like material: "An organic material may be called a rubber when it shows a high elasticity of 100 per cent. or more at room temperature, and when it does not lose this property upon storage at room temperature during considerable periods."

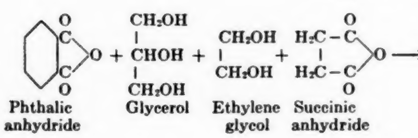
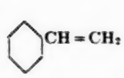
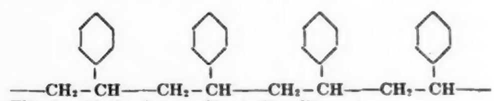
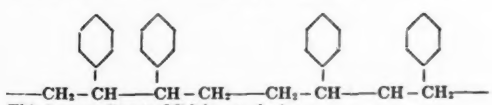
[14] Houwink, *India Rubber J.*, 92, 455 (1936).

TABLE 1. CLASSIFICATION FOR SYNTHETIC RUBBERS AND RUBBER-LIKE PLASTICS

Elastomers	Elastoprenes (derivatives of butadiene)	Butadiene rubbers: Sodium butadiene rubber, Russia*,†; Buna rubbers, Germany‡
		Piperylene rubbers¶
		Isoprene rubbers: Polyprene: natural rubber; Sodium isoprene rubber†; Heat-polymerized isoprene rubber†
		Dimethylbutadiene rubbers: Cold polymer: methyl rubber H§; Heat polymer: methyl rubber W§
		Haloprene rubbers: Polychloroprene rubber: Neoprene (*a*); Polybromoprene rubber (*b*)
	Elastolenes	Polymers, such as polyisobutylene, formed in the presence of a catalyst—e. g., boron trifluoride: Vistanex, Oppanol B (*c*)
	Elastothiomers	Polyalkylene sulphides: "Thiokol," Perduren (*d*)
	Elastoplastics	Rubber-like polymers of acrylic and methacrylic esters: Acranal, Plexigum‡
		Rubber-like mixed glyptals (*e*)
		Plasticized polyvinyl chloride: Koroseal, Igelite, Mipolam (*f*), ‡
		Polyvinyl acetate, above 40° C. (*g*)
		Polystyrene, above 65° C., and when partially solvated (*h, i, g*)
		Polyarylenethylenes or Polyxylenes: AXF, from benzene, ethylene chloride, and aluminum chloride (*j*)
		Polyphosphonitrilic chloride $(PNCl_2)x$, an inorganic rubber (*k*)
Plastomers	True thermoplastics	Shellac, polystyrene, polyvinyl acetate, celluloid, cellulose acetate
	Thermosetting plastics	Bakelite, glyptals, formaldehyde-urea polymers, acrylic resins

* Akobzhanov, *Rubber Chem. Tech.*, 8, 430 (1935).
† See footnote *.
‡ Koch, *Rubber Chem. Tech.*, 10, 17 (1937); paper presented at ninety-seventh meeting of A. C. S., Baltimore, 1939.
¶ See footnote [14].
§ See footnote [12].
(*a*) Carothers, Williams, Collins, and Kirby, *J. Amer. Chem. Soc.*, 53, 4203 (1931).
(*b*) Carothers, Kirby, and Collins, *Ibid.*, 55, 789 (1933).
(*c*) Brill and Halle, *Naturwissenschaften*, 26, 12 (1938); *Rubber Chem. Tech.*, 11, 687 (1938); Schwartz, *Kunststoffe*, 29, 9 (1939); I. G. Farbenindustrie, British patent No. 432,196 (1935); and other patent literature.
(*d*) Martin and Patrick, *Ind. Eng. Chem.*, 28, 1144 (1936); Patrick, *Trans. Faraday Soc.*, 32, 347 (1936).
(*e*) Wright, *Chem. & Met. Eng.*, 39, 438 (1932).
(*f*) Brous and Semon, *Ind. Eng. Chem.*, 27, 667 (1935).
(*g*) Whitby, *Trans. Inst. Rubber Ind.*, 5, 184 (1929); 6, 40 (1930).
(*h*) Midgley, "Chemistry and Technology of Rubber," 678 (1937).
(*i*) Staudinger, *Ber.*, 59, 3036 (1926); 62, 241, 2406 (1929).
(*j*) Shinkle, Brooks, and Cady, *Ind. Eng. Chem.*, 28, 275 (1936).
(*k*) Meyer, *Trans. Faraday Soc.*, 32, 148 (1936); *Rubber Chem. Tech.*, 9, 422 (1936); Schenck and Römer, *Ber.*, 57, 1343 (1924); Stokes, *Am. Chem. J.*, 17, 275 (1895); 19, 782 (1897).

Table 2. Structural Notes on the Substances Enumerated in Table 1

	Starting Materials		Probable or Possible Structures of Polymers
Butadiene	$CH_2=CH-CH=CH_2$	$\longrightarrow$	$—CH_2-CH=CH-CH_2—CH_2-CH=CH-CH_2—$ The Russian synthetic rubber is a sodium polymerized butadiene. The numbered Buna rubbers (Buna 32, etc.) are also sodium polymers. Buna S consists of mixed polymers of butadiene and styrene, polymerized in the form of an emulsion. Buna N similarly consists of mixed polymers of butadiene and acrylic nitrile ($CH_2=CH-CN$) prepared in the form of an emulsion.
Piperylene	$CH_3-CH=CH-CH=CH_2$	$\longrightarrow$	$—CH(CH_3)-CH=CH-CH_2—CH(CH_3)-CH=CH-CH_2—$
Isoprene	$CH_2=C(CH_3)-CH=CH_2$	$\longrightarrow$	$—CH_2-C(CH_3)=CH-CH_2—CH_2-C(CH_4)=CH-CH_2—$ In the natural rubber hydrocarbon, the methyl groups occur regularly along the chain. In the synthetic isoprene rubbers, the methyl groups occur more or less irregularly, since, when stretched, they do not give the x-ray fiber diagram. These unsymmetrical polymerides, judging from both chemical and x-ray results, have groupings somewhat as follows: $—CH_2-C(CH_3)=CH-CH_2—CH_2-CH=C(CH_3)-CH_2—CH_2-C(CH_4)=CH-CH_2—$
2,3-Dimethylbutadiene	$CH_2=C(H_3C)—C(CH_3)=CH_2$	$\longrightarrow$	$—CH_2-C(H_3C)=C(CH_3)-CH_2—CH_2-C(H_3C)=C(CH_3)-CH_2—$ The methyl groups occur regularly along the chain, as shown by chemical evidence, and this polymeric product when stretched gives an x-ray fiber diagram.
Chloroprene	$CH_2=C(Cl)-CH=CH_2$	$\longrightarrow$	$—CH_2-C(Cl)=CH-CH_2—CH_2-C(Cl)=CH-CH_2—$ In this polymeride the chlorine atoms evidently occur regularly, since when stretched it gives an x-ray fiber diagram.
Isobutylene	$CH_3-C(CH_3)=CH_2$	$\xrightarrow[-40^\circ\text{ C.}]{BF_3}$	Structure of the product is not known. The unsaturation is very low and probably occurs only in the "end molecule" of isobutylene. It is presumed that Oppanol B is the same or a similar substance. When stretched it gives an x-ray fiber diagram.*
Ethylene chloride + sodium polysulfide	$CH_2Cl-CH_2Cl + NaS_x$	$\longrightarrow$	$HS-CH_2CH_2-S(=S)—S(=S)-CH_2CH_2—S(=S)-S(=S)-\ldots\ldots-CH_2CH_2-SH$ Similarly with 2,2′-dichloroethyl ether, $ClCH_2CH_2-O-CH_2CH_2Cl$, etc.
Methyl acrylate	$CH_2=CH-COOCH_3$		$—CH_2-CH(CH_3OCO)—CH_2-CH(CH_3OCO)—CH_2-CH(CH_3OCO)—$
Methyl methacrylate	$CH_2=C(CH_3)-COOCH_3$	$\longrightarrow$	$—CH_2-C(CH_3)(CH_3OCO)—CH_2-C(CH_3)(CH_3OCO)—CH_2-C(CH_3)(CH_3OCO)—$
Mixed glyptals		$\longrightarrow$	Mixed esters of high molecular weight
Vinyl chloride	$CH_2=CHCl$	$\longrightarrow$	$—CH_2-CH(Cl)—CH_2-CH(Cl)—CH_2-CH(Cl)—$
Vinyl acetate	$CH_2=CH-OCOCH_3$	$\longrightarrow$	$—CH_2-CH(OCOCH_3)—CH_2-CH(OCOCH_3)—CH_2-CH(OCOCH_3)—$
Styrene (vinyl benzene)		$\longrightarrow$	 This formulation is according to Staudinger †  This is according to Midgley *et al.* ‡
Ethylene chloride + benzene	$CH_2Cl-CH_2Cl + C_6H_6$	$\xrightarrow{AlCl_3}$	$—CH_2CH_2-C_6H_4—CH_2CH_2-C_6H_4—CH_2CH_2-C_6H_4—$ The position of attachment on the benzene nucleus is not known; therefore, only the molecular formula is used.
Phosphorus pentachloride + ammonium chloride	$PCl_5 + NH_4Cl$	$\longrightarrow$	$(PNCl_2)_x$ $—P(Cl)(Cl)=N—P(Cl)(Cl)=N—$ Phosphonitrilic chloride

*See footnote (*c*), Table 1. † See footnote (*i*) Table 1. ‡Midgley, Henne, and Leicester, *J. Am. Chem. Soc.*, 58, 1961 (1939b).

This definition was criticized by Stevens[15] partly because it includes substances other than real rubber.

Midgley[16] discussed the question as follows: "It is impossible at the present time to define synthetic rubber in chemical terms. . . . Expressed in physical terms, the simplest definition is, 'those substances which possess the physical properties of rubber.' Such a statement is functional, and should be revised in terms defining a unique physical property of rubber. Several organic substances of high molecular weight may be stretched to many times their original lengths, i. e., gums, tars, waxes, jellies, etc.; but only rubber forcibly retracts to substantially its original size and shape after such stretching. Hence the definition becomes: 'Synthetic rubbers are those organic substances which possess the property of forcibly retracting to approximately their original size and shape after being greatly distorted, i. e., such as being stretched *x* per cent. of their original lengths.' Here *x* is some arbitrary value. It should be over 100, probably 400, possibly 600, but certainly not higher."

Bridgwater[17] describes "synthetic substances with rubber-like properties" as substances that resemble rubber in the simple property of extensibility or deformability under moderate loads, coupled with a tendency to recover their original form when the load is removed, although not necessarily to a degree comparable to the recovery exhibited by natural rubber.

The question of the underlimit of extensibility and of the rate and extent of retraction of a substance to bring it into the class of synthetic rubber or rubber-like materials has never been settled. A decision by an international agreement of organizations interested in these materials and, in fact an international effort to bring order into the entire subject of rubber terminology, as already suggested by Dawson,[18] would be helpful.

The Names Rubber, Isoprene, Etc.

Rubber was given its name because it has the property of rubbing out pencil marks, according to a record left by Joseph Priestley in 1770;[19] but the word was probably in use before that date. Languages other than English use words which were derived from the native words *caa o-chu* or *cahuchu*, meaning weeping tree: namely, *caoutchouc* in French, *Kautschuk* in German, etc. "Elastic gum" has been used in English, and similar words appear in Spanish and Italian, but rubber is not a true gum and therefore this is not a proper term.

The word "rubber" stands for more than a single chemical compound or a typical natural product. It is also used for vulcanized rubber and articles made from it—overshoes, elastic bands, etc.

As Stevens[20] says, "It is not an elegant word, and its derivation is almost ludicrous in contrast with its modern applications."

It is also not an international term. There is a question, therefore, whether it is advisable to use the word in a general term covering all types of rubber-like materials.

Weber named the rubber hydrocarbon "polyprene," which was coined from polymer and isoprene.

Isoprene was named by Williams[4] who states: "I have given the substance thus examined the name of *isoprene*. It would have been more grateful to me to have retained one of the names given by the previous observers, if that course had been possible; but Himly has not named the fluid discovered by him boiling between 33° and 44°, and the term *caoutchène* having been applied by Bouchardat to a fluid boiling at 14.5°, I could not adopt it; moreover, it is too like *caoutchine*."

The suffix prene has also been used in chloroprene which is structurally similar to isoprene, with a chlorine atom in the place of the methyl group in position 2 of butadiene. Although the origin of the suffix prene is not known, it has been associated with rubber for many years and therefore is worth keeping in future names.

Recent Class Terms for Rubber-like Substances

Although there is some justification for the term "synthetic rubber," it seems best that it be used chiefly in connection with products that are related chemically to natural rubber—that is, to the various derivatives of butadiene. Usage, however, will determine this. At any rate there is a need of a single term which can be used to cover all rubber-like products.

The subject of the use of the words "synthetic rubber" and the need of a single term was discussed recently in the correspondence of Stevens,[15] Barron,[21] and Naunton.[22] In this correspondence the most desirable words suggested are "collastics," from colloid and elastic, by Barron, and the self-explanatory "elastoplasts" by Stevens, or "elastoplastics" as modified by Naunton. These have good derivations and are worthy of consideration.

Another suggestion is "caoutchoid" or "couchoid" by Patterson.[23] He points out that the word rubber is English and not an international word and that, therefore, rubberoid (rubber-like) would not be generally acceptable. Accordingly he uses the word caoutchouc as the basis of a better derivative and suggests the words given. Since caoutchoid has "an abominable spelling," he thinks that the unpronounced letters could be dropped to form the simple term "couchoid."

These suggestions are good, and only time will tell how much they will be used. To the writer "collastic" seems to emphasize the colloidal property in preference to the more important elastic property of rubber. "Elastoplastic" has much to recommend it although it has five syllables and is not easy to speak. "Couchoid" has an excellent derivation, but it, too, is not easy to say.

New Suggestions

The writer also comes into the discussion with new suggestions, the first of which is "elastomer." This word is reminiscent of isomer, electromer, metamer, and polymer, and it is hoped that it may prove of general service. In a conversation on this subject, the writer's colleague, W. C. Moore, suggested "plastomer" to cover the nonelastic plastic substances, and the writer presents elastomer to cover the elastic or rubber-like substances. Elastomer is easy to speak, has a scientific derivation, and emphasizes the elastic properties of all these substances.

For a general term to cover the rubber-like polymers of butadiene and its derivatives, including chloroprene, the writer suggests "elastoprenes;" for the polyisobutylenes, "elastolenes;" and for the polyethylene sulphides, "elastothiomers."[24] The derivation of each of these terms is obvious. He further suggests that Stevens' term "elastoplastics" be used as the name of that growing class of rubber-like plastics which includes the rubber-like glyptals and polymethyl methacrylates, plasticized vinyl chloride, etc.

[15] Stevens, *J. Soc. Chem. Ind.*, 55, 276, 328, 443, 814 (1936).
[16] See footnote (*h*), Table 1.
[17] Bridgwater, *Rubber Age* (*N. Y.*), Oct., 1938, p. 21.
[18] Dawson, *Proc. Rubber Tech. Conference, London,* 1003 (1938).
[19] Barker, *Rubber Age* (*N. Y.*), May, 1938, p. 103.
[20] Stevens, *J. Soc. Chem. Ind.*, 55, 814 (1936).
[21] Barron, *J. Soc. Chem. Ind.*, 55, 844 (1936); *India Rubber J.*, 92, 542 (1936).
[22] Naunton, *J. Soc. Chem. Ind.*, 55, 297, 328 (1936).
[23] A. M. Patterson, personal communication.
[24] In the paper as originally presented, the polyethylene sulphides were called "thiolastics."

Classification

Jacobs[25] recently classified synthetic rubbers under the following four headings: (*a*) halo- or halogenorubbers (Neoprene), (*b*) alternative or co-rubbers (Buna), (*c*) thio-rubbers ("Thiokol" and Perduren), and (*d*) plasto- or reso-rubbers (vinyl polymers and other unvulcanizable thermoplastic polymers made from hydrocarbons).

The classification given in Table 1 is offered for all the synthetic rubbers and rubber-like polymers and plastics. Table 2 contains structural notes on the substances mentioned in Table 1. The long bonds in the structural formulas of the polymers are used to indicate the places where the original molecules are joined together.

This article is not presumed to be the last word on the subject. It is written with the hope that it will help to clarify the present confused situation in regard to the use of the term "synthetic rubber," and to help classify all the substances with rubber-like properties. It is also hoped that the article will stimulate more thinking on the subject and soon bring order out of the present nomenclatural chaos.

After this paper was presented the author accidentally came across the terms "lastic" and "synlastic," used by Ellis.[26] Also, his attention was called to the proposals of Kindscher[27] in which crude rubbers, synthetic rubbers (from butadiene and its derivatives, "Thiokol," Neoprene, etc.), and rubber-like polyvinyl compounds, polyisobutylenes, etc., are classified under the terms *Kautschukgene, Kautschukoide,* and *Gummoide.*

Acknowledgment

The writer is grateful to E. J. Crane, H. E. Howe, H. J. D'Innocenzo, W. C. Moore, and A. M. Patterson for their interest, encouragement, and helpful suggestions.

[25] Jacobs, *Caoutchouc & gutta-percha*, 35, 35 (1938).
[26] Ellis, *Ind. Eng. Chem.*, 28, 1138 (1936).
[27] Kindscher, *Kautschuk*, 14, 140 (1938); *Rubber Age (London)*, 19, 286 (1938).

Rubber for Tree Surgery

INDIA RUBBER WORLD[1] described the results of a seven-year experiment with the use of rubber block in tree-cavity fillings, developed by George Van Yahres, president, Van Yahres Tree Service, Inc., Westbury, L. I., in conjunction with The B. F. Goodrich Co., Akron, O. Today a resurvey of this method reveals 6,500 rubber fillings in use, improvements and refinements in installation methods, and a growing acceptance of rubber by tree surgeons as the best material that has been developed for this purpose.

In general the method of using rubber filling blocks, which form a facing across the front of the cavity, has not changed since 1937. Over-sized rubber strips are fitted in horizontal layers across the mouth of the opening and compressed firmly into position. Recent studies of blocks first installed nine years ago reveal that rubber provides a simple, but permanent seal against air, moisture, fungi, and insects; permitting free flexing of the tree without abrasive injury often caused by harder, non-resistant materials; and adhering to the new growth of bark as it tends to grow over the filling.

But the back fill, the material behind the blocks, and the method of installing it have changed. Formerly a combination of ground vulcanized rubber and wax was used, which has now been superseded by a filling material of wood excelsior coated with latex and then dried. This improved fill is tamped in place behind the rubber blocks, as was the former material, but a new step has been added, made possible by the invention of a steam pressure machine, which could not be used with the former substance. Once the new back fill is placed, the pressure machine is used to pump live steam into the base of the filling, from where it circulates throughout the excelsior, curing the latex and at the same time sterilizing the surface of the cavity. Use of live steam for this antiseptic purpose is not possible except with rubber blocks.

Wax, although no longer a part of the back fill, still plays a part in the new process. After the hollow is sterilized with live steam, hot wax, at a temperature of 400° F., is pumped in, closing all voids and giving double protection against parasitic organisms and the possibility of re-infection.

[1] "Rubber Aids Tree Life," Dec. 1, 1937, pp. 47-48.

Tank Lining Materials

THREE tank lining materials for corrosive services have recently been developed: Rubber-X, a latex compound; Tygon, a modified halide polymer with rubber-like properties; and Resilon, mineral base material of a thermoplastic nature.

Rubber-X, less expensive than sheet rubber linings, may be applied to steel, wood, concrete, enamel, or stoneware surfaces, using special primers which provide a strong bond. The latex preparation is not suitable with solutions at temperatures over 175° F., or for use with solvents, concentrated nitric acid, concentrated sulphuric acid (over 50%), or solutions of strong oxidizing agents.

Tygon may be used as a covering or lining material for tanks, pipe, and process equipment or for covering such objects as laboratory table tops, hoods, and sinks. Available in a range of physical properties similar to natural rubber, Tygon can be extruded and molded into various shaped articles. Displaying a more general resistance to corrosion than natural rubber, this material is immune to attack by most acids, including nitric and hydrofluoric; glacial acetic acid is an exception. Hydrocarbons, with the exception of natural gas condensate products, do not affect Tygon, but, like natural rubber, it is attacked by the chlorinated solvents and creosote. Thermoplastic at elevated temperatures, it is generally not serviceable much in excess of 150° F. However this property permits welding with a hot iron during fabrication or repair. Also, it does not deteriorate upon aging.

The Resilons, said to provide the most economical corrosive coverings, are semi-flexible and resistant to practically all mineral acids, with the exception of concentrated sulphuric acid (over 50%), nitric acid (over 10%), chromic acids, or active oxidizing agents. They are also resistant to caustic solutions, plating solutions, and salts, but are of no service where hydrocarbons or organic solvents are present. The Resilons adhere firmly to clean metal, concrete, wood, brick, tile, or glass surfaces, forming non-tacky, flexible coverings which will not crack or check from thermal changes or exposure to low temperatures. The coverings have a dielectric strength comparable to hard rubber and, therefore, provide effective insulation on plating tanks. Resilons are in bulk or sheet form; while a special grade appears in the form of a water emulsion.

Distributers' Tire Stocks

In the United States, July 1, 1939[1]

THE results of the quarterly survey of retail stocks of automobile tires and inner tubes, as of July 1, 1939, are shown below in comparison with summary data for preceding quarterly surveys, the bases and methods described in previous reports having been used in calculating the stocks held by the following three groups of distributers: 1. individual dealers, including large and small retailers; 2. distributers through oil-company chains; 3. manufacturer-owned-and-operated stores, mail-order houses, and other important retail chains.

Distributers' Stocks Indicated by Surveys

Total distributers' stocks of motor vehicle casings on July 1, 1939, are estimated at 6,864,000, against 6,817,000 (revised) on April 1, 1939, and 7,009,000 on July 1, 1938. Although the overall volume of stocks shows little change, current dealers' stocks are reduced 118,000 and oil companies' stocks are reduced 79,000 below the April 1 figures; while other mass distributers' stocks show a probable increase of 234,000 during the second quarter. Unusually heavy replacement shipments of casings by the manufacturers, culminating in a very high figure for June, did not result in appreciable increase in total distributers' inventories at the end of the second quarter.

	Thousands of Casings			
1936	Dealers	Oil Companies	Other	Total
Estimated	3,500	1,650	2,000	7,150
1937				
April 1	3,835	1,853	2,304	7,992
July 1	3,363	1,996	2,299	7,658
October 1	3,000	1,774	2,289	7,063
1938				
January 1	3,015	2,115	1,920	7,050
April 1	3,007	1,869	2,051	6,927
July 1	2,767	2,079	2,163	7,009
October 1	2,588	1,840	1,990	6,418
1939				
January 1	2,735	1,838	1,920	6,493
April 1	3,018	1,725	*2,074	*6,817
July 1	2,900	1,646	2,318	6,864

Total stocks of inner tubes at 6,434,000 are at a new record low level for recent years, owing chiefly to continuous reductions in tube stocks by oil companies during the past two years. Reduction in tube stocks is also reported by dealers during the second quarter, but other mass distributers report increased inventories.

	Thousands of Inner Tubes			
1937	Dealers	Oil Companies	Other	Total
April 1	4,910	2,019	2,170	9,099
July 1	4,050	1,960	2,129	8,139
October 1	3,525	1,957	2,038	7,520
1938				
January 1	3,547	2,127	1,717	7,391
April 1	4,021	1,918	1,728	7,667
July 1	3,560	1,805	1,786	7,151
October 1	3,132	1,781	1,727	6,640
1939				
January 1	3,445	1,733	1,599	6,777
April 1	3,460	1,626	*1,588	*6,674
July 1	3,220	1,393	1,821	6,434

Formerly oil companies carried many more tubes than casings in stock, but their ratio of tubes to casings now is approaching that of other mass distributers.

[1] Special Circular Vol. 13, No. 13, Rubber Section, Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C.
*Revised, on basis of delayed returns.

Dealers' Reported Stocks

The following table compares the stocks reported by 1,140 dealers for 1,567 stores in the current survey, with the stocks reported by the identical firms April 1, 1939. Dealers holding over 500 casings each have slightly higher total stocks of casings on July 1; while casings stocks of the smaller dealers have declined, and stocks of inner tubes are reduced for all three groups of dealers. The overall declines in stocks of both casings and inner tubes are reflected in the index numbers and carried into the summary above. The large number of dealers reporting for July, but not in the preceding survey (753 dealers with 1,020 stores) results in part from circularization of and cooperation from additional dealers newly added to the mailing list, periodic additions being necessary to maintain the volume of reports received.

	July 1, 1939					
	Number of		April 1, 1939		July 1, 1939	
Number of Casings	Dealers	Stores	Casings	Tubes	Casings	Tubes
Under 200	746	843	76,644	111,357	67,973	100,521
200-500	240	330	78,558	98,644	72,361	88,142
Over 500	154	394	194,039	193,469	195,691	183,961
Total	1,140	1,567	349,241	403,470	336,025	372,624
Other July, '39	753	1,020			148,306	164,646
Total July, '39	1,893	2,587			484,331	537,270
Index Numbers			85.8	98.9	82.5	91.6

Oil-Company Distributers' Reported Stocks

Reports were received from 37 identical firms distributing tires through chains of filling stations, some reports covering stocks in central warehouses only, while others also covered stocks in retail outlets, in the April and July surveys. A reduction in stocks of casings, and a much greater reduction in stocks of tubes bringing them to a record low level, noted from the comparative totals, are recorded in the index numbers and summary estimates.

	Comparative April 1	Totals July 1	Other July 1
Number of Firms	37	37	3
Casings	984,495	939,353	10,193
Inner Tubes	927,467	794,102	12,915
Index Numbers:			
Casings	104.5	99.8	.....
Other	98.6	84.4	.....

Other Mass Distributers' Reported Stocks

Reports were received from six tire manufacturers operating 2,167 (April, 2,150) retail stores and covering stocks held in these outlets, and from six other mass distributers operating 1,687 (April, 1,698) stores and covering their total stocks on hand as of July 1. The manufacturers' stores were holding lower stocks of casings, but higher stocks of inner tubes than in April; the other firms reported higher aggregate stocks both of casings and tubes. Stocks reported here by manufacturers are presumably also included in manufacturers' inventory as reported by The Rubber Manufacturers Association, Inc. Two firms which reported on April 1 did not report July

(*Continued on page* 43)

Plasticization

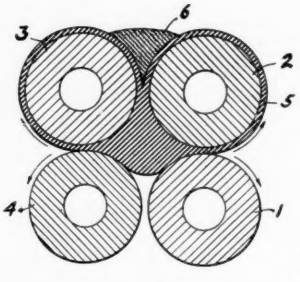


Fig. 1. Diagram of Four-Roll Mill

ONE of the most significant advances in early rubber manufacture was achieved in 1820 when Thomas Hancock invented his "masticator" and discovered that raw rubber could be softened and plasticized by intensive mechanical working. The transformation to the plastic state requires heavy expensive machinery utilizing large amounts of energy. Much success has been attained as a result of efforts to reduce the time and energy required to plasticize rubber. The following patent abstracts discuss some of the recent developments in this phase of rubber technology.

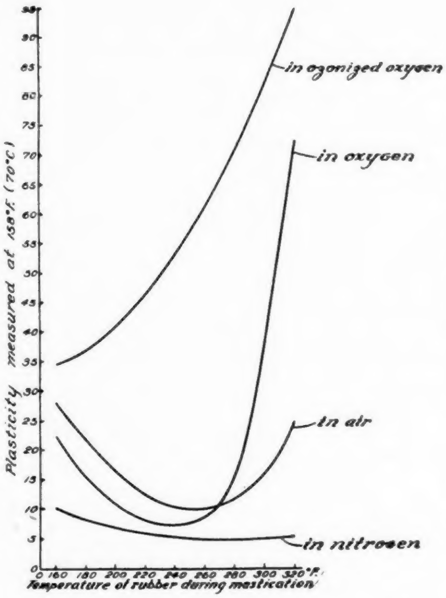


Fig. 2. The Effect of Temperature on the Plasticization of Rubber When Masticated in Various Gases

Four-Roll Mill [1]

This four-roll rubber processing mill, while retaining the advantages of the ordinary two-roll mill, will overcome its disadvantages in that relatively much larger batches may be plasticized and mixed in less time and with little, if any, of the laborious "cutting back and forth" required on present mills. As shown in the diagram, Figure 1, the mill comprises four hollow steel rolls 1, 2, 3, and 4 rotatably mounted in journal boxes and driven by spur gears. The journal boxes are adjustable to provide for the proper spacings between the rolls. Rolls 1 and 3 are driven in a clockwise direction; while rolls 2 and 4 are driven in a counter-clockwise direction. For confining the rubber to the working surfaces of the rolls, end plates are provided at each end of the rolls as in usual mill practice.

The preferred manner of operating the mill is also shown in Figure 1. The various adjusting screws are set so that the space between rolls 1 and 2 and between rolls 3 and 4 are each equal to the thickness of rubber sheet which customarily is handled in ordinary mill practice. Experience has shown that most satisfactory results are attained if the ratio of the space between the rolls 2 and 3 to the sum of the spaces between the rolls 1 and 2 and the rolls 3 and 4 is from 1.2 to 1.8. The space between rolls 1 and 4 may be slightly less than the space between rolls 1 and 2, and 3 and 4.

When the proper roll spacing adjustments have been made, the rolls are rotated in the directions indicated at speeds comparable to present mill practice, and a quantity of rubber 5, sufficient to form continuous sheets around two of the rolls and to fill the central kneading cavity, is fed into the bite of the upper two rolls 2 and 3. The rubber is carried to the central cavity where it is intensively kneaded and extruded simultaneously between the side rolls 1 and 2, and 3 and 4. The two sheets of rubber are carried over the upper rolls and returned to the bite between these rolls. After a few minutes' mastication the rubber will be plasticized sufficiently to form continuous coherent sheets around the two rolls.

When the rubber has been plasticized sufficiently, the compounding materials 6 may be poured upon the converging rubber sheets in the bite of the upper rolls, and the mechanical working continued. The compounding material is rapidly and efficiently distributed throughout the batch and little, if any, "cutting back and forth" is required; the compounding material is folded in between the two converging sheets of rubber. Fresh rubber surfaces are constantly presented for reception of compounding material, and no unworked uncompounded layer can remain adjacent to the mill rolls. In some instances it may be desirable to cut the rubber back and forth a few times to insure uniformity of the mixed rubber throughout the length of the mill. When mastication and mixing are completed, the rubber may be cut from the mill in strips as in usual milling practice.

Tests upon mills of comparable size show that the four-roll mill is capable of mixing several times the weight of rubber composition per unit of time that may be mixed upon the two-roll mill. In addition to greater capacity and reduction in the "cutting back and forth" operation the job of recovering compounding material which falls from the rolls to the mill pan and returning it to the mill is minimized.

Activated Oxygen [2]

Rubber is plasticized in a minimum time and with a minimum of mechanical working and power consumption by means of concurrent intensive mechanical working and chemical treatment of the rubber with oxidizing gases.

In a series of tests conducted in a laboratory-size internal mixer successive batches of rubber of similar initial plasticity characteristics were masticated in atmospheres of different gases and under varying temperature conditions. In each case the final plasticity of the rubber was determined (with a Goodrich simplified plastometer), and the data plotted as shown in Figure 2. The results of these tests show that when rubber is masticated in the presence of air or ordinary oxygen gas, the rate of plasticization decreases rapidly, as the temperature is raised

[1] U. S. patent No. 2,078,777, Apr. 27, 1937.
[2] U. S. patent No. 2,115,705, May 3, 1938.

from 160° F., and reaches a minimum at a temperature between 240 and 260° F. In the latter temperature range the plasticization is only slightly greater than in the case of nitrogen. Thereafter the rate of plasticization in air and oxygen increases with further increases in temperature. When the mastication is carried out in an atmosphere containing a substantial proportion of activated oxygen such as ozonized oxygen, however, the effect is quite different. There is no decrease, but a continuous steady increase in the rate of plasticization as the temperature is raised from 160 to 320° F., so that extraordinarily effective plasticization may be achieved by masticating at the very temperatures at which mastication in the presence of ordinary oxygen is least effective, and for all practical purposes is almost completely ineffective.

This discovery is of importance because practical considerations ordinarily require that factory mastication operations be carried out at temperatures ranging from about 200 to about 300° F. Operations at lower temperatures are as a practical matter prohibited by cooling difficulties as a great deal of heat is produced by the mechanical working of the rubber; while at temperatures higher than about 300° F. serious mechanical trouble may be encountered by reason of seizure or failure of bearings in the masticating apparatus. Also, thermal decomposition of the rubber becomes increasingly rapid at higher temperatures. In the present process, using activated oxygen, the rate of plasticization is substantially accelerated throughout the preferred temperature range indicated.

Carbon Dioxide[3]

Raw rubber is subjected to the action of carbon dioxide gas under pressures substantially higher than atmospheric and at elevated temperatures for a sufficient period of time to soften or depolymerize the rubber. As a result of this treatment, the stock is effectively broken down or plasticized and may be more easily milled and mixed with the compounding ingredients in a comparatively shorter time and with much less consumption of power than in the customary procedure. Where softening agents are to be employed, they may be added to the rubber, without any substantial mixing, before the carbon dioxide treatment. Liquid materials may be poured over the rubber in the pressure vessel. The carbon dioxide acts as a carrier and penetrating agent to disperse the softening agents, which are volatile under the conditions obtaining, throughout the mass of the rubber, and thus save subsequent consumption of power in the milling step. In addition this results in a rubber stock having greater tensile strength and greater uniformity.

In carrying out the process, the raw rubber may be in sheet form or cut into pieces of convenient size and enclosed in a vessel from which the air may or may not have been evacuated. The presence of small proportions of air is not objectionable. Carbon dioxide is then introduced into the vessel at a pressure of between 25 and 100 pounds per square inch. The vessel may be heated to a temperature in excess of about 330° F. The pressures, temperatures, and times employed may be varied, but a pressure of 50 pounds per square inch, a temperature of 330 to 340° F., and a heating period of two to three hours have been used successfully.

Hydrazines[4]

Rubber is plasticized by subjecting it to the action of a small amount of a complex organic compound, a chemical addition product of a metal salt and an unsymmetrically substituted hydrazine, for a sufficient length of time to produce a substantial increase in the plasticity of the rubber. These hydrazines have a greater plasticizing action than materials previously employed and cause softening when used in relatively small amounts without producing a material swelling action on the rubber. The effect of these plasticizers is largely destroyed during vulcanization.

Rubber is probably composed of micelles which in turn consist of a larger number of molecules. The softness or plasticity of the rubber is largely determined by the state of gelation and size of the micelles. Any reduction in their degree of association or size will result in a softening action. The hydrazines referred to above apparently reduce the size or the degree of association of the micelles to a much greater extent than any other compounds heretofore known for this purpose. The change in the state of the rubber gel induced by the hydrazines is not instantaneous, but requires more or less time to develop. Upon standing for a period of time, the rubber becomes softened, the softening effect continuing until an equilibrium condition is reached. A beneficial softening action will in general be noticed in periods of time which may vary from 15 minutes to two days. The amount of agent added may be varied within an extremely wide range, depending upon the rubber, the other compounding ingredients, and the desire of the user. However, for economical reasons, it will generally be found that from 0.1 to about 5% will be sufficient for most purposes.

[3] U. S. patent No. 2,095,673, Oct. 12, 1937.
[4] U. S. patent No. 2,132,505, Oct. 11, 1938.

Calculating Steam Costs

A CONTRIBUTOR has submitted the following method for practical computation of the cost of steam for individual factory operations such as heating, humidifying, creating drafts, atomizing, blowing soot, vulcanizing, and even steam leaks.

Every rubber mill operator who uses steam should be entirely familiar with Napier's "steam flow rule" which is applicable to any problem where steam flows directly from high boiler pressure into the atmosphere.

Where a solid fuel such as coal is used, the following formulae apply:

$$\text{Steam gage pressure (in lbs. per sq. in.)} + 14.7 = \text{Absolute pressure (in lbs. per sq. in.)}$$

$$\frac{\text{Absolute pressure} \times \text{area of opening (in sq. in.)}}{70} = \text{Weight of escaping steam per second}$$

$$\frac{\text{Absolute pressure} \times \text{area of opening (in sq. in.)} \times \text{cost of fuel (in \$ per 2,000 lbs.)} \times 0.257}{\text{Pounds of water evaporated per lb. of fuel}} = \text{cost of escaping steam (in \$ per 10-hour day)}$$

Where oil is used, apply the following:

$$\frac{\text{Absolute pressure} \times \text{area of opening (in sq. in.)} \times \text{cost of oil (in \$ per gal.)} \times 64.3}{\text{Pounds of water evaporated per lb. of oil}} = \text{cost of escaping steam (in \$ per 10-hour day)}$$

THE UNITED STATES DEPARTMENT OF AGRICULTURE, growing rubber trees in Florida to see if they would withstand its winters and wanting to know if the trees would stand up under Florida winds; found rubber trees will not bend any further in a hurricane without breaking than any average tree, but protect themselves from sudden tropical storms. Once winds reached hurricane velocity, the rubber trees dropped their leaves. This eliminates wind resistance near the top of the tree, and pressure on the trunk is lessened. Afterward new leaves come out, and there is no apparent damage to the tree.

United States Consumption of Latex

SEPARATE statistics on consumption of latex, collected by the Department of Commerce in its survey of 1938 rubber consumption, with other data provide a basis for discussion of the probable trend of latex consumption in recent years, although conclusions must lack certainty. Imports of latex, after having risen annually from 5,084 long tons in 1932 to 11,085 tons in 1933 and to above 13,000 tons in both 1934 and 1935, again increased sharply to 19,852 tons in 1936 and the peak of 23,186 tons in 1937, then underwent a 49% decline to only 11,878 tons in 1938, when consumption reported to the Department of Commerce amounted to 13,609 tons.

Probable Trend of Domestic Stocks, 1935-38

Quarterly import statistics, considering that latex storage facilities in this country have not been excessive, show quite conclusively that from the first half of 1935 through the first half of 1937 the use of latex was increasing steadily and at a fairly rapid rate. In mid-1937 the industry was not anticipating the sharp decline in business activity that set in shortly thereafter, and distributers of latex continued to import heavily during the third quarter, taking 5,623 tons, and also in the fourth quarter with 5,847 tons (second highest quarterly total to date). It is probable that stocks of latex in this country were no more than normal at the end of the first quarter of 1937 and that a fairly heavy increase in the second quarter when arrivals set the high record at 6,190 tons failed to arouse apprehensions of holders whose minds were engrossed with the then sharply fluctuating price of rubber. At the end of the third quarter stocks on hand must, however, have been substantial and at the year-end must have reached about their zenith.

UNITED STATES QUARTERLY IMPORTS OF LATEX
(Tons)

Quarters	1935	1936	1937	1938	1939
First	2,631	4,553	5,526	4,063	5,324
Second	3,791	4,981	6,190	2,463	5,638
Third	3,426	5,225	5,623	2,193	.....
Fourth	3,705	5,093	5,847	3,159	.....
Total	13,553	19,852	23,186	11,878	.....

Lacking accurate consumption data, speculation and surmise must be resorted to in clarifying the situation. Suppose about two months' supply of latex on hand were taken as a logical "normal" point to start from. In terms of 1935 last quarter imports this would have meant a stock of a little above 2,200 tons, in 1936 nearly 3,300 tons, in mid-1937 over 4,000 tons. Consideration of the quarterly imports of latex and the general trend of rubber consumption would, however, make it appear that probably at the end of 1937 the domestic stocks of latex doubtless aggregated fully 7,000 tons.

Estimated Latex Consumption, 1935-1938

There have been substantial shipments of latex from the United States to foreign countries, but their amount is not definitely known, as shipments in the nature of re-exports are combined with re-exports of other crude rubber, while shipments of latex to which ingredients have been added in this country are classified as domestic exports of "rubber manufactures not elsewhere specified," a group which includes miscellaneous rubber products. These shipments of latex would reduce the quantity available for local consumption.

The following table shows the officially reported imports, and estimates of possible re-shipments, year-end total stocks and stock changes, with estimates of consumption calculated as an end figure.

IMPORTS AND ESTIMATED STOCKS AND CONSUMPTION
(Tons)

		Estimates			
	Official Imports	Re-shipped	Year-End Stock	Stock Change	Consumption
1935......	13,553	300	2,200	— 200	13,453
1936......	19,852	500	3,300	+1,100	18,052
1937......	23,186	700	7,000	+3,700	18,786
1938......	11,878	500	3,000	—4,000	15,378

The accuracy of these consumption estimates depends considerably on whether the volume of re-shipments is reasonably approximated. Little is known concerning this trade, except that word of such shipments has occasionally been heard. In round figures, however, it appears that domestic consumption probably was near 13,500 tons in 1935, 18,000 tons in 1936, 19,000 tons in 1937, and 15,000 tons or more in 1938, this last figure being 1,400 tons above the 1938 consumption actually reported (incomplete) to the Department of Commerce.

Officially Reported 1938 Consumption

The *Rubber News Letter* of August 15 (Leather and Rubber Division), containing statistics for 1938, reported latex consumption by groups of companies as follows:

1938 REPORTED LATEX CONSUMPTION

Firms Using	No. of Firms	Consumption Lbs.
over 500,000 lbs.	10	23,897,707
190,000 to 500,000	10	2,542,988
110,000 to 190,000	10	1,580,628
49,000 to 110,000	20	1,520,802
20,000 to 49,000	20	605,230
5,000 to 20,000	24	291,989
under 5,000 lbs.	28	44,977
	122	30,484,321

Principal Uses of Latex

While this statement does not reveal definitely the products in which latex was chiefly consumed, the products of some firms are known to have included latex in the following items: rubber thread, rubberizing of piece goods, carpet manufacture, other combinations with textiles, rubber cements of various kinds, can sealing preparations, sponge rubber mattresses, other sponge rubber products, toy balloons, rubber gloves, other dipped goods, medicated plasters and adhesive tape, electrolytic deposition, manufacture of paper products, experimental laboratories, etc. This list is incomplete, but

somewhat indicative. Probably large quantities of rubber cements are produced by manufacturers for use in other end-products, aside from the production for sale.

Trade Comment and Future Outlook

With regard to the decline in consumption in 1938, statements have been noted from various sources. Stocks of latex were certainly excessive at the end of 1937 and in early 1938, but were about normal at the end of 1938. Consumption of latex by certain companies was of minor importance in the first half of 1938, but expanded very rapidly thereafter; in fact some factories were and are anxious as to future supplies. There was certainly a decline in consumption of latex in 1938 compared to 1937, less than the 19.4% decline in general rubber consumption according to the consensus of trade opinion, but one important firm states that its 1938 sales of latex compounding ingredients showed a very healthy increase. The possibility that dispersions of rubber or reclaimed rubber might have replaced latex in some former applications was suggested by one trade contact, but this has not been established. Rapid increase in output of sponge rubber and rubber thread from latex in the last half of 1938 was another source of comment.

Analysis of the quarterly reports of rubber consumption issued by The Rubber Manufacturers Association, Inc., indicates that less than half of the total latex consumption could have been used for sponge rubber, druggists' rubber sundries, and rubber clothing and bathing apparel in recent years; the association's reported consumption of all types of rubber for these items was 7,868 tons in 1936, 9,543 tons in 1937, and 6,485 tons in 1938. The first quarter of 1939 shows a total of 2,370 tons, an increase of 72.5% over the first quarter of 1938, but well under the high record of 2,677 tons for the first three months of 1937.

It is difficult to escape a conclusion that use of latex in cements used for a wide range of manufacturing purposes and particularly in tire manufacturing and retreading may have been an important factor in latex consumption, but statistics are not available to show this definitely. And cements have been made to a large extent from solutions of dry rubber. It is also possible that while consumption of latex by numerous firms was increasing in 1938, the consumption by a few very important consumers may have declined sharply.

As to the outlook for 1939, it seems probable that total domestic consumption will easily surpass that for any previous year. Imports during the second quarter have been exceeded only in two previous quarters, and May arrivals of 2,786 tons set a new high monthly record—twice in the first half of this year monthly imports have exceeded 2,000 tons, against three times in all of 1937 and once in 1936. Larger supplies have come forward with each quarter during the past twelve months. Nevertheless, if automobiles are increasingly equipped with sponge rubber upholstery, there would be need of many additional rubber producing companies to engage in supplying rubber in latex form.

Buna Industry in New German Territories

C. M. Magnus

SHORTLY after Austria was annexed by Germany, efforts were stressed to effect mutual collaboration within the rubber industry of Greater Germany. An agreement was recently concluded under the protectorate of the German Department of Commerce, whereby the Semperit-Austro-American Rubber Co. will avail itself of the technical experiences of the major German rubber manufacturer, the Continental Rubber Co., Hannover, without losing its independence.

Since the incorporation into the Greater Germany of the Sudeten territory, the Matador Rubber Co. near Pressburg, a subsidiary of the Semperit Rubber Co., is also included in this agreement. Including the Matador Rubber Co., Semperit now operates three rubber factories and one asbestos factory.

In view of the shortage of crude rubber these plants are now compelled to adapt their equipment to the manufacture of Buna (synthetic rubber), for which purpose large investments are necessary, which are obtained by credits, guaranteed by the government.

The Semperit company, prior to the treaty of Versailles, practically enjoyed a monopoly in the Austrian-Hungarian empire. With Austria after the treaty reduced to about one-eighth of its former population the rubber industry had great difficulties in overcoming these adverse conditions. Other markets had to be developed; and while the export business was not profitable, it kept up production. However in the days of the World War eight factories operated in Austria-Hungary, but the number in little post-war Austria was only two.

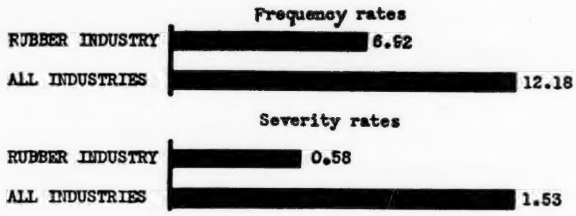
Since the incorporation of Greater Germany, Semperit's three plants (including the one near Pressburg, formerly in Czechoslovakia) were not only operating at capacity, but had to increase production. Consequently new buildings are being added, and additional real estate was acquired for anticipated expansion.

The tariffs on rubber goods, existing between the Reich and the Austrian provinces shortly after the annexation of the latter country, are now practically removed. Even the prices on finished goods, save for a special tax, are almost identical. The special tax imposed derives from the fact that the Austrian rubber companies have not as yet been in a position to produce Buna. However all necessary steps have been taken to accomplish the change from crude rubber to Buna in the near future.

It is interesting to note that the erection of a Buna factory in the Sudeten district is anticipated, in the neighborhood of Bruex, the logical site because of the vast soft-coal mines in that territory. The intention of encouraging industry in that area suggests the eagerness of the German government to reduce unemployment in that much-suffering territory.

RECENTLY A MAN WAS FATALLY INJURED WHILE REpairing the discharge gate on a Banbury mill. The hydraulic pressure would not operate the discharge gate; chain blocks were tried, but unsuccessfully. It was then decided to dismantle the gate mechanism to determine the cause of the jammed gate. The hydraulic pressure had not been turned off so that when the saddle was loosened from over the piston, the piston shot out, striking the man and causing a fatal injury. *N. S. C.*

Rubber Industry Accident Rates Decrease in 1938[1]



Comparison of Rubber Industry with All Industries

IN THE past one of the most hazardous of all industries, the rubber industry today stands among the leaders of industrial safety. Much credit is due those men in the industry whose duty has been to assure safe working conditions and to instruct workers in safe operating principles. Not to be forgotten also are the manufacturers of machinery and equipment who, through improvement in design including streamlining and the incorporation of safety features, have materially reduced the possibility of hazardous operation of their equipment.

Outstanding Facts for 1938

The 1938 injury experience of the rubber industry is based on reports covering 38 plants, 51,023 employes, and an exposure of 85,388,000 man-hours. Among 30 major industries the rubber industry stood fifth in accident frequency and third in severity.

The following facts briefly cover the important phases of the rubber industry's accident experience for 1938:

1. 1938 injury rates for the rubber industry were 6.92 for frequency[2] and 0.58 for severity.[3] Both rates are sharply below the corresponding rates of 12.18 and 1.53 for all industries.

2. The industry's frequency rate is down 12% from 1937; the decrease in severity amounts to 43%. 1938 rates for all industries averaged 16% lower in frequency and 5% lower in severity.

3. The improvement in frequency since 1926 is 72%, and the reduction in severity is 58%. These reductions considerably exceed those achieved in all industries.

4. Small plants, on the whole, had the best records during 1938. They averaged 5.98 for frequency and 0.44 for severity and reduced frequency 22% and severity 20% in comparison with 1937.

5. Of the various branches of the industry, rubber footwear plants had the lowest frequency rates during 1938, averaging 3.03. Mechanical rubber goods plants had the lowest severity, averaging 0.33. Mechanical rubber goods plants also had the best results in comparison with 1937, reducing frequency 33% and severity 82%.

6. Reports covering 49 fatalities and permanent partial disabilities occurring during the last five years show that the principal mechanical causes of such injuries were unsafe processes, poor housekeeping, and improper guarding. The principal personal causes were disobedience of instructions, abstraction, haste, and similar wrong attitudes.

Best No-Injury Records

The following no-injury records are the best all-time records known to the National Safety Council, each record representing the number of continuous man-hours worked without a disabling injury.

MECHANICAL RUBBER GOODS. The U. S. Rubber Co., Inc., Providence, R. I., holds the best all-time record for this branch of the industry, and also for the entire industry, by working 5,688,369 man-hours without a disabling injury between February 19, 1935, and October 7, 1936.

RUBBER FOOTWEAR. U. S. Rubber, Naugatuck Plant, set a new record of 3,599,730 man-hours. The record began April 8, 1938, and terminated October 25, 1938.

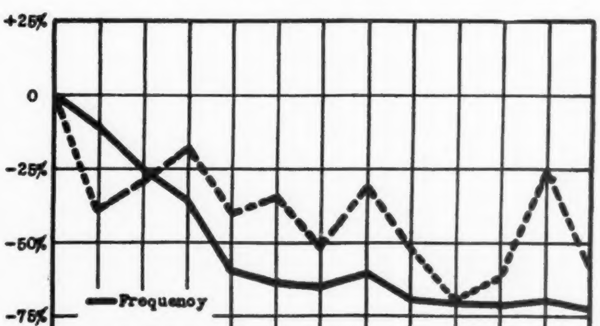
TIRE MANUFACTURING. The Goodyear Tire & Rubber Co., New Toronto, Canada, holds the best all-time record of 3,372,670 injury-free man-hours established between May 1, 1932, and March 21, 1934.

RUBBER RECLAIMING. The U. S. Rubber Reclaiming Co., Buffalo, N. Y., leads by working 476,710 man-hours between August 18, 1930, and October 9, 1931.

The following list contains the names of companies making outstanding safety achievements during 1938.

MECHANICAL RUBBER GOODS. Goodyear, The Windsor Mfg. Corp., Windsor, Vt., a subsidiary, had the lowest 1938 frequency rate among large units—1.10. The Buitenzorg, Java, plant had the lowest 1938 severity rate—0.05. Van Cleef Bros., Chicago, Ill., worked more hours

(*Continued on page* 41)



Percentage Changes in Accident Rates, Rubber Industry

[1] Abstracted from "1938 Accident Rates in the Rubber Industry," National Safety Council, Inc., 20 N. Wacker Dr., Chicago, Ill.

[2] Injury frequency rate is the number of reportable injuries per 1,000,000 man-hours of exposure.

[3] Injury severity rate is the number of days lost as the result of reportable injuries, per 1,000 man-hours of exposure. This rate includes arbitrary charges for permanent disabilities and deaths, in accordance with the standard scale.

Electrically Conductive Rubber[1]

NORMALLY an electrical insulator, rubber can be made conductive to extend its usefulness to a wider field, in applications requiring a non-rigid and flexible conductor. Past proposals to impart conductivity involved the addition of certain carbonaceous or metallic materials. These, however, are said to be usually detrimental to other properties of the rubber and to provide, at best, variable electrical properties. Several years ago the Dunlop Rubber Co., Ltd., of Birmingham, England, developed a new process which is claimed to produce rubber with a high degree of electrical conductivity without impairing the physical characteristics.

Properties

With the new process rubber of excellent mechanical properties can be produced with a specific resistance ranging from 10^{15} to 1 ohm/cm^3, according to the hardness required: soft rubbers, 10^{15} to 1000 ohms; tire tread compounds and rubber of similar hardness, 10^{15} to 10 ohms (the usual figure for a conducting tire tread is about 50 ohms); hard rubbers, 10^{15} to 1 ohm or less.

The temperature coefficient of electrical resistance is generally negative and is about -0.5% per degree Centigrade from 50° to 100° C., but it may have a positive value below 40° C. The use of this rubber for power dissipation is limited by the foregoing and also by the heat aging of the rubber and by its low thermal conductivity; the maximum temperature should not exceed 120° C. for short periods or 40° C. for long periods.

If the rubber is soaked in a swelling agent such as gasoline, its conducting properties are temporarily destroyed, but are restored upon drying out. Distortion produces a temporary partial loss of conductivity, the amount depending upon the degree of distortion. Thus, 10% stretching halves the conductivity, which ultimately regains its full value after the rubber is released. The continuous flexing that tires, for instance, undergo increases the initial resistance of conducting rubber to a certain level, which may slowly increase still further with aging. These changes, however, are not sufficient to impair the efficiency of the rubber in the applications cited below.

Applications

The use of conducting rubber provides for the discharge of accumulated static charges derived from air, road, and other types of friction. Applications of this type include: automobile tires where friction between the tire tread and road may generate a charge up to 5,000 volts if non-conducting rubber is used; airplane tires to discharge static electricity upon landing; hospital flooring and tires on wheeled hospital equipment, particularly in those departments where ether is used; rubber punching blocks, flooring, mats, and boots in explosive and firework factories to prevent the ignition of powders or dust by static discharges; rubber rolls, belts, and conveyers in certain industries (cotton and paper) where the conductive-rubber equipment is used so as to prevent the attraction or cohesion of charged particles or sheets; sandblasting hose to prevent shock from discharge of frictionally developed electricity.

There are other applications which involve current electricity. For example, conductive rubber is used for tires on electrically driven trolley buses which are fed from high voltage lines. Should a current leakage develop, the chassis and body of the vehicle become "alive," and the use of conducting tires provides a definite ground that makes it possible to detect leakage by means of instruments, and at the same time by shunting the leakage current to the ground the tires automatically protect passengers from shock. Conducting rubber also eliminates corona discharge and resulting ozone cracking on high voltage cables. Used for auto ignition cables, it gives a distributed resistance, thus suppressing interference with radio reception, and it has been proposed to use it as a conductive core for X-ray cables.

[1] Information contained in this article was obtained from Dunlop Rubber Co., Ltd., Birmingham, England.

"All-in" Costs of Plantations[1]

A TABLE giving all-in costs for 393 rubber plantation companies ranging in size from 400 to 35,000 acres, with the average all-in costs stated by size groups, was published in connection with an article by Herbert Ashplant.[2] In assembling the records from Rickinson's June 30, 1938, "Rubber Companies' Position," the author omitted "companies which exploit other products than rubber to an extent that would invalidate the costs comparisons."

Using the published table as a basis, and weighting the estates according to their acreage (actual production data were not included in the table), it is possible to derive a reasonably close comparison of approximate average all-in costs for estates in various size groups. This comparison reveals that estates over 5,000 acres appear to have appreciably lower average all-in costs than smaller production units, which, however, show progressive economy in production costs with increased size up to group 4. In the article referred to, these conclusions were not drawn, however. The overall average works out at a trifle less than 5 d. per pound.

Group	Size Group (Acres)	Estates (No.)	Total Area (Acres)	Average All-in Costs (Pence per Pound)
1.	400 - 1,000	59	52,150	5.51
2.	1,250 - 2,000	133	218,100	5.28
3.	2,500 - 5,000	138	478,000	4.95
4.	6,000 - 10,000	44	335,500	4.82
5.	12,000 - 20,000	13	199,000	4.86
6.	25,000 - 35,000	6	185,000	4.86
		393	1,467,750	

[1] "Rubber News Letter," Dec, 15, 1938.
[2] *India Rubber J.*, (Internat'l Issue), Nov., 1938.

Neoprene Cements[1]

Howard W. Starkweather and Frederick C. Wagner[2]

A SOLUTION of Neoprene resembles those of other colloids in showing a marked increase in viscosity with increase in concentration. The viscosity of a Neoprene solution of any given concentration depends upon the plasticity of the Neoprene used in the preparation of that solution, much the same as the viscosity of a natural rubber solution depends upon the state of degradation of the rubber. The viscosity of a Neoprene solution, like that of natural rubber, also varies with the type of solvent.

A study of the factors affecting the viscosity and stability of Neoprene-benzene cements has been made on cements prepared from uncompounded and compounded Neoprene. Neoprene Type E was compounded with 10 parts of light calcined magnesia, 5 parts of zinc oxide, and 5 parts of FF wood rosin per 100 parts of Neoprene. With Neoprene Type G the use of rosin is unnecessary. The cements were prepared by dispersing the Neoprene or Neoprene compounds in thiophene-free benzene by slowly rotating the container until a homogeneous dispersion was obtained. Concentrations are expressed on the total solids basis. Samples of the smooth dispersions were transferred to Gardner-Holdt bubble tubes, and the viscosity was measured at 76° F. (24.4° C.). The bubble tubes were then stored at 120° F. (48.9° C.), and the viscosity was measured at intervals of one to two weeks until the more concentrated dispersions had increased in viscosity by several hundred per cent. or gelled particles had appeared. This method of measuring the viscosity was considered sufficiently accurate for the purpose, and it had the advantage that no solvent was lost during storage at the elevated temperatures. Portions of the samples were also stored for several months at room temperature in larger containers. Cements were considered stable until they had increased more than 100% in viscosity, or until gelled particles appeared or complete gelation occurred.

Effect of Concentration

Data illustrating the influence of concentration on the viscosity of fresh cements are shown in Figure 1. Neoprenes Type E with a plasticity-recovery of 84–4 and Type G with a plasticity-recovery of 113–10 were used in preparing these solutions. The plasticity-recovery numbers in 0.001-inch were determined at 80° C. on 2-cc. pellets with the Williams parallel plate plastometer.[3]

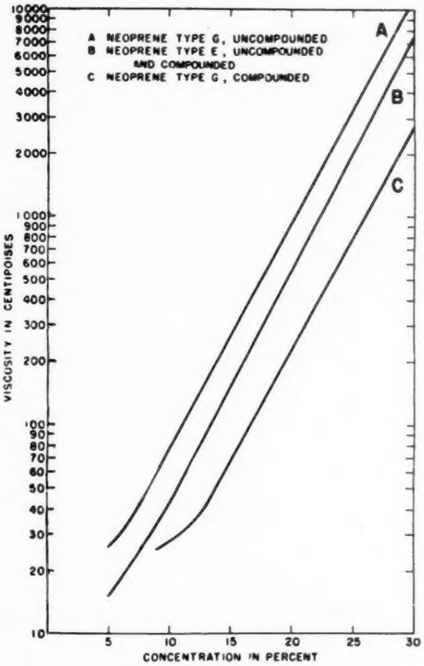


Fig. 1. Effect of Concentration on Viscosity of Neoprene Cements

The Type G had been plasticized by milling under water according to the method recommended for obtaining water plasticized Type GW.[4]

The viscosity measurements were made in Gardner-Holdt bubble tubes. The conversion to centipoises was made by means of a curve drawn from results obtained with standard solutions in a similar set of tubes. The results are believed to be accurate within 5–10%.

It is apparent that the viscosity of a Neoprene Type E cement is changed very little by compounding with curing agents, but that the viscosity of the more concentrated compounded Type G cements is definitely less than the corresponding uncompounded cements. The difference between curves *A* and *B* is partly due to the fact that this particular Type G sample was somewhat less plastic than the Type E.

The measurements obtained with these Type E cements, after aging at 120° F. and at room temperature, are given in Table 1.

Table 1. Neoprene Type E Cements in Benzene

Concentration, %	Bubble Tube Viscosity at 76° F., Seconds: After Weeks Aging at 120° F.: 0	1	2	3	4	6	8	10	After 5 Mo. at Room Temp.
				Uncompounded Cements					
5	0.8	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.8
10	1.2	1.2	1.2	1.2	1.1	1.2	1.2	1.2	1.0
15	2.7	2.4	2.2	2.2	2.4	2.2	2.4	2.8	3.2
20	7.2	7.0	6.2	6.0	6.0	6.2	6.6	8.0	11.4
25	23.8	23.8	22.5	...	21.5	24.0	28.4	...	40
30	108	99	92	105	120	Gel	...	...	114
				Compounded Cements*					
5	0.6	0.7	0.7	0.8	0.7	0.8	0.8	0.8	1.0
10	1.0	1.0	1.0	1.0	1.2	1.0	1.0	1.0	1.2
15	2.2	2.4	2.2	2.4	2.4	2.7	3.2	4.2	2.8
20	7.3	7.3	8.0	14	10.5	14	20	45	12
25	25.4	28.4	32.5	67	Gel	...	...	...	65
30	110	115	180	300	Gel	...	...	...	175

*100 Neoprene, 10 light calcined magnesia, 5 zinc oxide, 5 FF wood rosin.

Cements of uncompounded Neoprene Type E up to 25% concentration are stable for eight weeks at 120° F. or for five months at room temperature. The compounded 20% cements were stable for five months at room temperature, but for only six weeks at 120° F. The more concentrated cements are definitely less stable.

Similar data for Neoprene Type G cements are given in Table 2. On aging the more concentrated uncom-

[1] Contribution No. 40 from Jackson Laboratory, E. I. du Pont de Nemours & Co., Inc. Presented before the Division of Rubber Chemistry, A. C. S., at the Baltimore meeting, April 3 to 7, 1939. Reprinted from *Ind. Eng. Chem.*, Aug., 1939, pp. 961-63.
[2] E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
[3] Williams, *Ind. Eng. Chem.*, 16, 362 (1924).
[4] Catton and Fraser, E. I. du Pont de Nemours & Co., *Rept.* 38-9, Oct., 1938.

TABLE 2. NEOPRENE TYPE G CEMENTS IN BENZENE

Concentration, %	Bubble Tube Viscosity at 76° F., Seconds — After Weeks Aging at 120° F.: 0	1	2	3	4	6	8	10	After 5 Mo. at Room Temp.
	Uncompounded Cements								
5.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
9.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2
13	2.4	2.2	1.6	1.5	1.2	1.4	1.4	1.6	1.8
16.7	6.2	5.2	3.2	2.8	2.8	3.4	4.6	Gel	4.0
20	7.0	4.8	4.0	3.2	...	4.0	5.5	...	9.8
25	30.6	17.6	14.5	15.5	...	23.0	45	...	50
30	161.5	57.5	70.0	145	265	Gel	...	...	47
	Compounded Cements*								
5.0	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8
9.0	0.8	0.8	0.8	0.8	1.0	0.8	1.2	2.8	1.0
13.0	1.0	1.0	1.2	1.4	1.8	6.4	Gel	...	1.2
16.7	1.6	1.6	1.8	3.2	6.0	Gel	...	...	2.6
20	7.2	10.0	25.5	Gel	...	...	...	...	50
25	13.4	25.5	275	Gel	...	...	...	...	65
30	31.0	Gel	...	...	...	...	...	...	Gel

*100 Neoprene, 10 light calcined magnesia, 5 zinc oxide.

pounded Type G cements, the viscosity decreased quite markedly for some time before it started to increase. This phenomenon did not appear in the case of the compounded cements, although it should be noted that the viscosity of the more concentrated compounded cements is lower than that of the similar uncompounded cements. These compounded cements show an increase in viscosity on aging without a preliminary decrease. This is analogous to the change in plasticity of compounded and uncompounded Neoprene Type G upon storage. The uncompounded Type G cements were nearly as stable as the corresponding Type E cements, but the compounded Type G cements apparently are less stable than Type E cements.

Effect of Added Compounds

The decrease in the viscosity of compounded Neoprene Type G cements over the similar uncompounded cements is believed to be due to the influence of the alkaline magnesia. Similar effects have been noted with alkaline organic materials. Data obtained with cements made from Neoprene Type G to which 2% diphenylguanidine had been added are shown in Table 3.

TABLE 3. NEOPRENE TYPE G CEMENTS IN BENZENE + 2% DIPHENYLGUANIDINE

Concentration, %	Bubble Tube Viscosity at 76° F., Seconds — After Weeks Aging at 120° F.: 0	1	2	3	4	6	8	10	After 5 Mo. at Room Temp.
	Uncompounded Cements								
5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
9	0.8	0.8	1.0	1.0	1.0	1.0	1.2	1.8	0.8
13	1.2	1.2	1.2	1.6	2.4	13.4	Gel	...	1.1
16.4	1.8	1.8	2.2	4.2	8.2	Gel	...	...	2.0
30	28.8	39.5	Gel	...	...	...	...	...	45
	Compounded Cements								
5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
9	0.8	0.8	0.8	0.8	1.0	1.8	Gel	...	1.0
13	0.9	1.0	1.2	2.5	Gel	...	...	...	1.2
16.4	1.6	1.6	4.2	Gel	...	...	...	...	2.2
30	30	45	Gel	...	...	...	...	...	Gel

A comparison of Tables 2 and 3 shows that the addition of diphenylguanidine to the uncompounded cements resulted in a marked decrease in the original viscosity. There is no corresponding decrease in the viscosity of the compounded cements with the addition of diphenylguanidine. The addition of diphenylguanidine rendered the more concentrated cements less stable at 120° F., but the stability as measured at room temperature was very little affected.

Similar data for Neoprene Type E containing 2% diphenylguanidine are given in Table 4.

A comparison of Tables 1 and 4 shows that the addition of diphenylguanidine has very little effect on the original viscosity of the Type E cements. It appears to render the uncompounded Type E cements less stable, but to improve somewhat the stability of the corresponding compounded cements.

TABLE 4. NEOPRENE TYPE E CEMENTS IN BENZENE + 2% CEMENTS IN BENZENE

Concentration, %	Bubble Tube Viscosity at 76° F., Seconds — After Weeks Aging at 120° F.: 0	1	2	3	4	6	8	10	After 5 Mo. at Room Temp.
	Uncompounded Cements								
5	0.8	0.8	0.7	0.7	0.7	0.7	0.8	Gel	0.8
10	1.2	1.2	1.2	1.2	1.0	1.2	1.2	Gel	1.1
15	3.2	3.2	3.2	3.0	3.2	2.2	2.4	4.2	3.0
20	13.0	13.2	13.2	Gel	...	...	...	...	Grainy
30	113.0	126	120	130	Gel	...	...	...	117
	Compounded + 2% D. P. G. Cements								
5	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	1.0
10	1.0	1.0	1.0	1.0	1.2	1.0	1.0	1.0	1.2
15	2.6	2.4	2.2	2.4	2.4	2.6	2.8	3.2	2.4
20	8.0	8.0	8.2	8.0	9.0	9.4	10.0	16.0	7.8
30	105.0	135.0	160	190	290	Gel	...	...	115

Since it would be desirable to improve the stability of the more concentrated cements, the effect of a number of compounds was investigated. Some of them had comparatively little effect; others, such as catechol, caused the gelation of the cements. The results obtained with two compounds which actually stabilized the cements are shown in Figure 2. Tricresylphosphate appears to act as a diluent and improves the stability in proportion to the amount used. Sodium thiosulphate produces a much more marked effect, and 1% gives appreciably greater stability than either 0.1 or 5%.

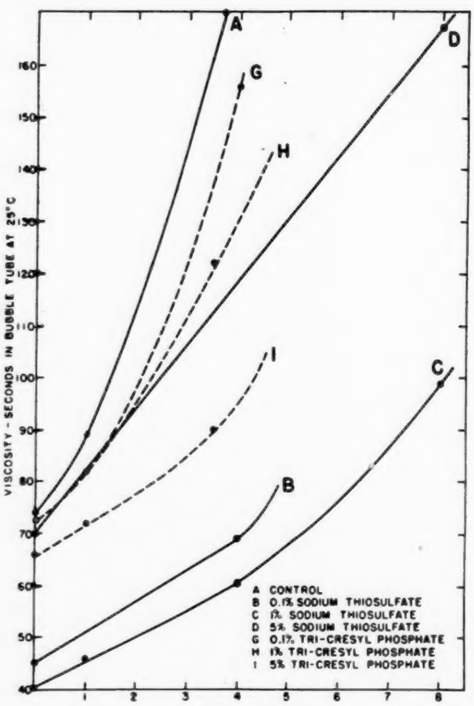


Fig. 2. Effect of Various Compounds on Compounded 30% Cements (Neoprene Type E)

A series of experiments with benzene of different purity showed no significant variations. However as Table 5 shows, the moisture content may have a marked effect on the viscosity of the more concentrated cement. It had comparatively little effect on the 10% cements.

Viscosity of Dilute Cements

The relative viscosity of dilute cements, prepared from a number of different samples of Neoprene, was determined at 30° C. in an Ostwald type viscometer which flowed

TABLE 5. INFLUENCE OF WATER ON VISCOSITY OF COMPOUNDED NEOPRENE TYPE E BENZENE CEMENTS

	Bubble-Tube Viscosity, in Sec., at 76° F. after Weeks Aged at 120° F.:		
	0	5	0
Water, %	10% Cements		30% Cements
0	1.2	4	88
0.1			90
0.4			223
0.5 } 0.7 }	2.0	3	Too viscous to measure
1.0	2.2	3.2	
3.0	3.2	3.2	

a volume of 7.2 cc. through a capillary 0.816-mm. in diameter and 4.5 cc. long under a mean head of 9.9 cc. of solution. From these measurements the intrinsic viscosity has been reported. The intrinsic viscosity $[\eta]$ is defined by the expression,

$[\eta] = (\eta r - 1)/c$ (as c approaches 0)
where $[\eta r]$ = viscosity of solution relative to that of solvent
c = concentration, grams/100 cc. of solution.

Data for solutions containing 2.0, 1.0, and 0.2 gram per 100 cc. of solution are shown in Figure 3. These data show that $[\eta]$ increases materially with increasing concentration, and that there is an approximately linear relation between $[\eta]$ and the plasticity plus recovery of various samples of Neoprene.

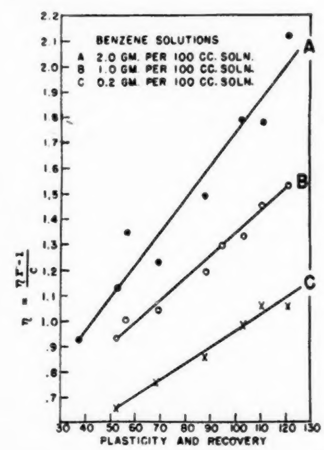


Fig. 3. Relation of Plasticity + Recovery to Intrinsic Viscosity of Neoprene

If the conclusions of Staudinger and his school are accepted, these results indicate that the molecular weight of the Neoprene decreases with increasing plasticity. Calculations of the apparent molecular weight, from the sedimentation equilibrium and intrinsic viscosity measurements by J. B. Nichols, of the du Pont Experimental Station, also indicate that the more plastic Neoprene has the lower apparent molecular weight. He obtained apparent molecular weights varying from about 200,000 to about 500,000, using samples of this same general plasticity range.

As indicated by Williams,[5] the variation in the results obtained with different solvents must be taken into consideration in drawing theoretical conclusions. The effect of solvents noted for rubber is also found in the case of Neoprene, as Table 6 shows.

The relative viscosity of Neoprene dissolved in amyl chloride is definitely lower than that of Neoprene dissolved in benzene. Similar measurements, made with natural rubber by Williams, are included for comparison. In both cases the specific viscosity is higher in benzene than in amyl chloride, but for the same concentration the effect is much greater with natural rubber than with Neoprene. This difference might be interpreted as indicating that the Neoprene was solvated to a less extent than the natural rubber.

[5] Williams, *Ind. Eng. Chem.*, 29, 172 (1937).

TABLE 6. EFFECT OF SOLVENTS ON VISCOSITY

	Plasticity-Recovery	Concn., G. per 100 Cc.	$[\eta r]$ in Benzene	$[\eta r]$ in Amyl Chloride
Neoprene	105-5	2.0	4.55	3.41
		1.0	2.45	1.88
		0.2	1.21	1.13
	50-2	2.0	3.24	2.41
		1.0	1.93	1.55
		0.2	1.13	1.09
Rubber	....	2.0	1.24	7.74
		1.0	4.17	2.72
		0.25	1.47	1.21

Tire Stocks

(Continued from page 32)

data in time for inclusion in this circular. Upward revisions resulting from returns will be noted in the figures for April 1 mass distributers (other) stocks in the summary table, where the estimates of 100% July stocks, based on the indexes from comparative totals, are stated.

REPORTED COMPARATIVE DATA

	April 1	July 1
Number of Firms	12	12
Number of Stores	3,848	3,854
Casings	1,957,100	2,186,834
Tubes	1,501,937	1,719,803
Index Numbers:		
Casings	100	111.6
Tubes	...	87.8

Stocks of New York Dealers

Stocks reported by 105 New York State dealers with 129 stores in the current survey amount to 44,822 casings and 57,559 inner tubes, against 41,121 casings and 55,063 tubes reported by 119 dealers April 1. Of those reporting July 1, 69 held under 200 casings each, 19 between 200 and 500 casings, and 17 over 500 casings each. New York State accounted for 9.3% of the casings and 10.7% of the inner tubes reported by dealers in the current survey, against 8.1% and 9.4% respectively in April.

Accident Rates

(Continued from page 37)

without a disabling injury than any other small plant with a perfect 1938 record—323,000.

RUBBER FOOTWEAR. U. S. Rubber, Naugatuck Footwear Plant had the lowest 1938 frequency rate—1.10. The Ball-Band Plant, Mishawaka, Ind., had the lowest 1938 severity rate—0.07.

TIRE MANUFACTURING. Goodyear, Gadsden, Ala., plant had the lowest 1938 frequency rate among large units—1.25; the England plant had the lowest 1938 severity rate—0.05; the New Toronto, Ont., plant had the lowest 1938 frequency rate among small units—0.46; the Bowmanville, Canada, plant had the lowest 1938 severity rate among small units—0.02. Gillette Rubber Co., Eau Claire, Wis., made the largest reduction in frequency from 1936 to 1938, among large units, 32%; also the largest improvement in severity, 83%.

Future Safety

While the present safety record of the rubber industry is one of merit and while the industry's reductions in accident rates since 1926 considerably exceed those in all industries, there is still room for measurable improvement. During 1938, 591 disabling injuries in 38 rubber manufacturing units accounted for a total of 49,462 days of lost work (based on the National Safety Council's statistical methods).

Editorials

A Centennial Industry and Its Founder

ALTHOUGH the basic material was known and crude articles were fashioned at an earlier date, the effective use of rubber and, consequently, the rubber manufacturing industry as we know it today really originated one hundred years ago when Charles Goodyear found in sulphur and heat the secret of converting crude rubber into a serviceable and relatively stable mass. The greatly diversified application of the fruits of this discovery is due to the compatibility of rubber with numerous chemicals and its reaction to the influence of varied combinations with these materials so as to produce a wide fluctuation in characteristics. From this peculiar qualification has grown an industry which is outstanding in the diversification of its usefulness. It is true that this growth has been made possible by further research and invention which have resulted in new influencing materials, an extended knowledge of compounding and processing practice, and additional outlets for its usefulness, but the raw material rubber and the principle of vulcanization have remained essentially the same. Vulcanized rubber has been a very important factor in the creation of many of our modern conveniences, outstanding among which is the automobile.

Because of his life work with rubber, Goodyear was at that time peculiarly familiar with its characteristics, but nevertheless it is stimulating to note his unusual vision as to its future usefulness. Many of the great number of applications which he prophesied in his own book *Gum-Elastic,* published in 1855, were not realized until a long period had elapsed. This foresight may well have been responsible for his indomitable will to continue his work under such discouraging conditions as he faced almost incessantly. There is no evidence that at any time did he lose confidence in his objective, and his spirit of persistence is worthy of emulation.

During approximately the first half-century following the discovery of vulcanization the activities were confined to a limited number of product types prominent among which was footwear. Not until the advent of the rubber chemist was there marked change in the compounding and processing of rubber or notable expansion in its utility. Near the end of the nineteenth century increased activities were reflected in an increase in the formation of new companies along more diversified lines and the institution of chemical research with technical control of processing. This resulted in a very definite stimulation of the industry which was followed by extraordinary advancements destined to make possible the greater service and application with which we are familiar. Realization of the necessity for more technical knowledge together with contemporary inventions to which rubber was particularly helpful largely accounts for the wide expansion of the rubber industry during the twentieth century. This evolution has been on a logical and healthy basis in that, aside from the diversification and volume growth, there has been a definite improvement in the average quality of rubber goods which now deliver to the consumer a more satisfactory service and greater dollar value than previously. Outstanding progress is exemplified in the automobile tire.

While further strides will undoubtedly be made in the use of plasticized rubber, great interest is being centered in rubber latex and synthetic rubber-like materials with a view to widening the scope of influence of the rubber industry. Although several synthetic rubber-like materials are commercially available, there is only a relatively meager knowledge of the types which can be produced, the methods of processing, and the possibilities of future applications. As this knowledge is augmented by research and experimentation and as new applications are found, the resulting greater consumption or more efficient processes will reduce the cost of synthetic materials, which condition will in turn tend to expand its utility. With synthesis in its comparative infancy, it is well within the realm of prediction that the rubber industry may expand into many new fields of usefulness and thereby increase its influence on our future customs and livelihood.

Because the rubber chemist in late years has had such an important part in advancing and expanding the rubber industry which had its inception with Goodyear's discovery of vulcanization, it is fitting that this centennial of the birth of the industry should be celebrated under the auspices of the Rubber Division, American Chemical Society, as is planned for September 13 to 15, at the annual fall meeting of the society in Boston. This program is of such character as will present a suitable tribute to the man who made the industry possible.

Recognition of the untiring efforts which were necessarily exerted and the difficulties which were faced by Charles Goodyear in attaining his predetermined objective together with an evaluation of the accomplishments and further possibilities within the resulting industry should have a stimulating influence on future developments.

S. C. Stillwagon

EDITOR

What the Rubber Chemists Are Doing

A.C.S. Rubber Division Celebrates One Hundredth Anniversary of the Founding of the Industry

FEATURING the centennial celebration of Charles Goodyear's discovery of vulcanization, the American Chemical Society will hold its fall meeting September 11 to 15 at Boston, Mass. The Rubber Division which will have headquarters at the Parker House will be active all week with the following program: Monday morning and afternoon—symposium on plastics and resins to be held jointly with the Divisions of Petroleum and Paint and Varnish Chemistry; Tuesday morning and afternoon—symposium on X-ray studies of substances of high molecular weight to be held jointly with the Divisions of Physical and Inorganic, Colloid, and Organic Chemistry; Wednesday afternoon—general meeting celebrating the centenary of the discovery of vulcanization by Charles Goodyear; Wednesday evening—subscription dinner under the auspices of the Division of Rubber Chemistry, continuing the Goodyear Centennial celebration; Thursday morning and afternoon and early Friday morning—symposium on vulcanization, comprising 16 papers, with introductory remarks by G. K. Hinshaw, Goodyear Tire & Rubber Co.; Friday morning (starting at 10:10 a.m.) and afternoon—general sessions to include the presentation of 9 papers on diversified topics, closing with a report of the Crude Rubber Committee.

Rubber Division Calendar, September 11 to 15

Monday—Symposium, Plastics and Resins.
Tuesday—Symposium, X-Ray Studies.
Wednesday—Centennial Meeting and Banquet (Entire A.C.S.).
Thursday—Symposium on Vulcanization (concluded Friday).
Friday—Technical and General Sessions.

On Monday afternoon, September 11, three papers will be presented by the Division of Colloid Chemistry of interest to members of the Rubber Division: "*Hevea* Latex. Effect of Proteins and Electrolytes on Colloidal Behavior," W. G. Straitiff and A. R. Kemp, Bell Telephone Laboratories, Inc.; "Particle Size Determination of Colloidal Suspensions by the Supercentrifuge," E. A. Hauser and H. K. Schachman, Massachusetts Institute of Technology; and "Structural Studies of the Vulcanization of Rubber under Stretch," E. A. Hauser and I. N. Smith, M.I.T.

Abstracts or titles of the 25 papers to be presented at the technical sessions of the Rubber Division (scheduled to begin at 9 a.m.) on Thursday and Friday follow.

The Vulcanization of Rubber. A review is given of the early history of vulcanization and the beneficial changes wrought on rubber by Goodyear's famous process. An outline is also given of the methods used in vulcanization, the principal facts, and the theoretical considerations of the chemistry involved. Non-sulphur vulcanizing agents are listed, including some hitherto not described, yellow mercuric oxide and the combination of phenols and oxidizing agents. A comparison of their chemical activity brings forth the generalization that probably in all cases a reduction and an oxidation take place. If the agent is already in the reduced state, then it is necessary to add an oxidizing agent. An oxidizing agent generally makes a better vulcanizate with almost all non-sulphur agents. The reduced form probably adds to the rubber hydrocarbon and this addition product is then oxidized to make the vulcanizate.

Since all vulcanizates seem to be fundamentally the same, it is postulated by analogy that some of the sulphur during vulcanization is reduced to hydrogen sulphide, that the hydrogen sulphide adds to the rubber hydrocarbon forming a mercaptan, and that this mercaptan is oxidized by some of the sulphur to form a disulphide which may connect two sections of the same or of two different molecules. It is shown that many of the facts of sulphur vulcanization are explained by this theory. Harry L. Fisher, The U. S. Industrial Alcohol Co.

The Physical Changes Induced by Vulcanization. Although the immediate object of Charles Goodyear's experiments which led to the discovery of vulcanization seemed to have been to produce a form of rubber less sensitive to the changes of temperature, happily the process also produced improvements in the mechanical properties of much greater value than the original objective. Thus the field of usefulness of rubber was enormously expanded by virtue of the increase in tensile strength and the reduction of plastic flow and the relative stabilization of these properties against temperature changes. W. W. Vogt, Goodyear Tire & Rubber Co.

Effect of Vulcanization on the Structure of Rubber. A Problem in Probabilities. The large size of the crude rubber molecules makes it possible for only small traces of certain chemical reactions to have enormous effects on the mechanical or flowing properties of the rubber. It also makes it impossible at present to analyze the crude rubber sufficiently accurately to determine its true chemical structure, nor is it possible today to identify the enormous number of isomers that may be formed by chemical reactions. These facts explain why so little progress has been made in unraveling the many thousands or millions of reactions which may occur in the process of vulcanization.

While we may never know very much about the precise reactions that occur during vulcanization under different conditions, physical and chemical data in the literature make it possible to distinguish a few of the different types of bonds that are formed between the rubber molecules. One type of bond is more or less reversibly broken by heat, and perhaps also by accelerators in solution. These bonds are important in overcures of high-sulphur stock containing zinc and accelerators, and they probably involve secondary valence forces around sulphur atoms.

Other bonds which withstand elevated temperatures and are not broken by solutions of accelerators, are particu-

larly important in high accelerator-low sulphur stocks. These may involve primary valence bonds such as C-S-C or even C-C bonds. During overcures reactions occur which affect not only the tensile strength and elongation, but also the chemical unsaturation, etc., but little is known of their value.

The role of accelerators, activators, and fatty acids in determining the kind as well as the rate of reactions of rubber with sulphur probably cannot be explained by assuming that each material acts on the preceding one in the series. Some of them probably act more on the rubber than on anything else. To determine all reactions during the vulcanization of various accelerated compounds would be a Herculean task, requiring not only new and far better physical and chemical tests than are available today, but also probably new and better interpretations of the data. However, such results would be extremely valuable, as they would make it possible to reduce very greatly the amount of empirical testing that has to be done in developing new compounds. Such a problem could well be tackled jointly by the whole rubber industry through a cooperative research program. Warren F. Busse, The B. F. Goodrich Co.

Reenforcement as a Function of Vulcanization. A critical review is made of the suggestion that rubber-sulphur complexes formed during vulcanization are dispersed through the mix in the manner of fine powders and thus account for the physical effects. The explanation is rejected.

Certain data in the literature are interpreted as indicating that the effect noted by Menadue is due to oxidation effects. Facts on the behavior of zinc oxide in rubber-sulphur mixes are reviewed and it is suggested that this gelation may be caused by precipitation of metallic soap in some form which results in reenforcement.

The literature on retardation of cure by powders is reviewed and the reconciliation of the several points of views by more recent data is noted. C. R. Park, Firestone Tire & Rubber Co.

X-Ray Structure of Vulcanized Rubber. A view is given of all the significant X-ray results on the structure of rubber since the original work of Katz on stretched rubber in 1925. This serves as a basis for comparison of results on vulcanized rubber, and for a critical consideration of structural models proposed for rubber, and for the role of sulphur as a vulcanizing agent. The most important observations are: (1) the spacings and structure for stretched rubber are identical before and after vulcanization; (2) a three-times greater extension is required after vulcanization to produce a crystal fiber pattern; (3) remarkable hysteresis effects are observed in the appearance and disappearance of crystal interferences as tension is applied and released; (4) unvulcanized sol rubber produces no crystal fiber patterns even at 1000% elongation, but after vulcanization gives a pattern at 200% elongation; (5) the contention of many years, that the fiber spots for stretched rubber after once appearing do not change in sharpness or position but merely increase in intensity as new crystal individuals are formed with increasing elongation, is disproved by patterns characterized by long arcs instead of sharp spots; (6) there is some evidence of sharper interferences after vulcanization, possibly indicating an enlarged crystallite size, by means of sulphur linkages. Though there is some support for the two-phase theory of rubber structure, for the existence of crystallites rather than singly acting molecules, and for a physical rather than chemical interpretation of vulcanization, since chemically bound sulphur or bridge formation might reasonably be expected to exert some structural effect which should be apparent on diffraction patterns, the very useful X-ray results cannot be said to answer unequivocally either what is rubber, or what is vulcanization. G. L. Clark, University of Illinois.

The Effect of Variability of Rubber on Vulcanization. The foreword gives a brief history of the exploration of the variability of plantation rubber by vulcanization testing.

Until recently, vulcanization testing in the producing countries was carried out almost exclusively on simple rubber-sulphur mixes. The results of such tests are discussed in the light of the argument that they can be of little value to the consumer, since the testing mixes bear little relation to compounds in common trade use.

The testing formula approved by the Rubber Division of the A.C.S. and the old rubber-sulphur mix have both been used as a basis of comparison of a series of plantation rubbers in order to test the degree of parallelism of the old and the new techniques. The two testing recipes give results which are more similar than might have been expected from the strength of the criticism of the simple mixes by rubber technologists.

Some examples are given of the extent of the natural variability due to special causes, notably tapping systems, and this variability is compared with that introduced by the producer during preparation. Edgar Rhodes, British Rubber Producers Research Assn.

Methods for Control of Vulcanization by the Individual Incorporation of Vulcanizing Agents. Consideration is given to various forms of procedure in which introduction of one or more of the 'vulcanizing ingredients into the rubber is delayed until after the main mixing operation. This may occur in latex processes and is well known in various methods for the incorporation of constituents for the formation of a complete accelerator-complex in rubber by diffusion. Modifications of this latter procedure are indicated. D. F. Twiss, Dunlop Rubber Co.

Theories of Acceleration. The various theories that have been advanced from time to time over the past thirty-one years to explain the action of organic accelerators and the mechanism of acceleration, are given. Wherever consistent, a chronological order of discussion has been adopted, beginning with the work of Erdmann in 1908.

Earlier theories were confined for the most part to a purely chemical consideration for an explanation of acceleration. Recently the trend is toward a physical or physico-chemical method to investigate and correlate the facts concerning the action of accelerators. The principal theoretical discussions may be enumerated as follows: (1) Erdmann (1908) explained the accelerating action of sodium polysulphides by the assumption that thiozonide S_3 was formed and passed to the rubber. Vulcanized rubber was considered to be a thiozonide; (2) Ostromislensky (1916) proposed a similar explanation to account for the accelerating action of organic bases through the formation and subsequent decomposition of an amine trithiozonide or sulphene amine; (3) Dubosc (1918) considered the mechanism of acceleration to be due to the formation of thiocyanic acid and its decomposition into hydrogen cyanide and an active form of sulphur capable of reacting with rubber to bring about vulcanization; (4) Kratz and co-workers (1920) explained the action of amines through the formation of an additive compound with sulphur; this theoretical substance finds analogous compounds in tertiary amine oxides; this compound was considered a carrier of sulphur to rubber; (5) Bedford and co-workers (1921) classified accelerators as hydrogen sulphide polysulphide accelerators to explain the action of amines; and carbosulphydryl polysulphides to account for the activity of dithiocarbamates, dithio acids, and their derivatives; (6) Bruni and Romani (1921) believed disulphides to be the true accelerator from the observation they made that certain disulphides such as the thiuram disulphides would bring about vulcanization of rubber without the addition of sulphur; (7) Feuchter (1925) made a positive contribution in that he considered a complex compound of accelerator and sulphur to react with rubber at the double bonds; the accelerator was assumed to form a part of the vulcanizate; this would account for the observed disappearance of accelerators during vulcanization; (8) Naunton (1926) in discussing the action of certain basic accelerators considered the addition of the accelerator to rubber; this was considered to offer a point of attack for the addition of sulphur; (9) Nordlander (1930) supposed an adsorption of accelerator by rubber at the double bonds; these adsorbed compounds then react with the activated sulphur molecules; (10) Behre (1933)

offered a physico-chemical explanation of the action of accelerators; this is based upon the consideration that rubber is made up of negatively charged particles; (11) Margaritov (1936) stated that when amines are added to the system rubber-sulphur they are adsorbed on the sulphur, aiding in dispersion of sulphur and increasing the surface of contact between rubber and sulphur; (12) Langenbeck and Rhiem found through solubilities of sulphur and disulphide accelerators that an unstable compound of the two is formed; this is assumed to take place in rubber and serves as a method of activating sulphur. L. B. Sebrell, Goodyear.

The Vulcanization of Rubber from a Thermodynamic Viewpoint. The study of vulcanization from a thermodynamic viewpoint has not progressed beyond the elementary stages. A study of the polymerization of isoprene shows it to be possible to produce a vulcanized type polymer by direct polymerization. The relation between this polymer and natural rubber is unknown. The heat liberated during vulcanization bears a direct relation to the amount of combined sulphur and not to the change in physical properties of the rubber. Pigment incorporation in rubber produces vulcanized properties with little measurable energy change. The relatively small amount of experimental evidence indicates that the change in physical properties from unvulcanized to a vulcanized state is accompanied by a relatively small energy change. Ira Williams, J. M. Huber Corp.

The Mechanism of Oxidation of Vulcanized Rubber. Effect of Temperature, State of Cure, and Thickness. A previous investigation of the rate of oxidation at 60°, 70°, and 80° C. has been extended to 90°, 100°, and 110° C. The effect of time of vulcanization and specimen thickness on oxidation rate at 80° C. has also been determined. Studies were limited to the range of oxidation which accounts for substantial deterioration of physical properties. Physical deterioration has been correlated with quantity of oxygen absorbed. It was found that the rate of oxidation up to 90° C. is a linear function of time but at 100° and 110° C. the rate decreases as oxidation progresses. Over the temperature range 60° to 110° C. the rate of oxidation approximately doubles for each 7.5° C. increase in temperature, corresponding to a temperature coefficient of oxidation of 2.5 for each 10° C. rise in temperature. The quantity of absorbed oxygen corresponding to a given deterioration in tensile strength decreases as the temperature of oxidation is raised. With increased time of vulcanization the rate of oxidation increases and the quantity of oxygen equivalent to a given physical deterioration decreases. Variations in thickness of specimens have no effect on oxidation rate at 80° C. with a compound containing an antioxidant. The rate of oxidation is greatly reduced by vulcanizing with tetramethyl thiuram disulphide in place of sulphur. A. R. Kemp, J. H. Ingmanson, and G. S. Mueller, Bell Telephone Laboratories, Inc.

Influence of Vulcanization on Oxidizability. Vulcanizing Agents Other Than Sulphur. Charles Dufraisse and J. Le Bras, Institute Francais du Caoutchouc. (To be read by A. R. Kemp, of the Bell Telephone Laboratories. Abstract not yet available.)

What Is Optimum Cure? Since the advent of vulcanized rubber goods the industry has strived to develop a method for measuring best cure. Early hand and tooth tests were abandoned in favor of tensile and elongation measurements, and subsequently methods for measuring this best cure were proposed. Tensile strength, tensile product, and permanent set are perhaps the criteria which have been most widely used. All such properties are, however, unsatisfactory for estimating the optimum cure of a rubber product for a particular service, first because their maximum values are not reached at the same time of cure, and secondly because these characteristics are not in themselves reliable criteria of behavior in service.

The terms "optimum cure" and "technically best cure" are incomplete, and are of significance only when they are qualified by reference to some particular property which it is desired to be at the optimum point. J. C. Walton, Boston Woven Hose & Rubber Co.

Temperature Coefficient of Vulcanization. The manufacture of vulcanized rubber articles and the usefulness of manufactured rubber articles depend, to a large extent, upon temperature coefficient of vulcanization. While this is more or less taken for granted, it may be well to pause and enumerate the consequences if vulcanization had no temperature coefficient.

If the vulcanization reaction had no temperature coefficient, the rate of vulcanization would be a constant and entirely different techniques would have to be employed. As the matter stands today, rubber is vulcanized at an elevated temperature in a reasonably short time and relatively little vulcanization takes place in manufactured articles in use. It is upon these two fundamental bases that the rubber industry exists today. Despite the tremendous importance of temperature coefficient of vulcanization, there are unfortunately, very little published data. The data consist of the effect of temperature on the mold vulcanization of unaccelerated and accelerated soft rubber and hard rubber. These data have been collected, compared, and analyzed. The temperature coefficient of soft rubber containing reclaim has also been made available by private communication.

On the other hand, data on the temperature coefficient of vulcanization in air, steam, ammonia, nitrogen, and carbon dioxide are not available in the literature, which is unfortunate indeed.

To summarize, the available data on temperature coefficient of vulcanization have been analyzed with the aid of the Arrhenius equation. This analysis shows that the rate of combination of sulphur with rubber during vulcanization is a chemical reaction which exhibits a normal temperature coefficient. This fact enables the rubber technologist to place the technology of rubber on a scientific basis and control the degree of vulcanization of manufactured articles which, in turn, is very important with respect to their performance in service. R. H. Gerke, United States Rubber Co.

Effect of Reclaimed Rubber on Temperature Coefficient of Vulcanization. Temperature coefficients of vulcanization have been determined by free sulphur, T-50, and modulus data for five compounds, (A) with no reclaim, (B) with alkali whole tire reclaim, (C) with acid type whole tire reclaim, (D) with tread reclaim, and (E) with red tube reclaim.

Compounds B and D gave considerably higher values than compound A by all three methods. Stocks C and E gave intermediate values by all methods.

The T-50 method has the advantage of simplicity and speed and is quite adequate for most practical purposes. The free sulphur method is probably most accurately reproducible and not unduly difficult to perform. The modulus method, although preferred by some because of the greater practical significance of this property, has the disadvantage of being carried out on undercured compounds and involves considerable discretion in selection of conditions.

Values determined from modulus data are in general somewhat lower than those obtained by free or combined sulphur methods. In this investigation, values by the T-50 method are closer to those by modulus in case of most of the stocks containing reclaim but the T-50 value for the non-reclaim stock is very close to the free sulphur value and somewhat higher than that determined by modulus. W. S. Coe, Naugatuck Chemical Division of U. S. Rubber.

Low Temperature Set as a Measure of State of Vulcanization. When rubber is vulcanized with sulphur its tendency to freeze under tension is altered. This property has found quantitative expression in the T-50 test, a well-known means of estimating state of vulcanization.

In the T-50 test the percentage of set is the constant and the temperature required to produce a given set becomes the variable. In the present method, the temperature of the test is kept constant and the variation in the amount of set produced becomes the measure of the change in state of vulcanization. The method is quantitative and has the advantage of simplicity in equipment and manipulation. J. H. Fielding, Goodyear.

Vulcanization of Latex. C. E. Bradley, U. S. Rubber. (Abstract not yet available.)

The Rubber-like Properties of Polybutene. Polymers prepared by polymerizing butenes at low temperatures resemble rubber in many physical characteristics. They differ from rubber chemically in that they are essentially saturated.

The polybutenes have not thus far been vulcanized by conventional methods; they are inert toward ozone and concentrated acids; when stretched they exhibit an X-ray pattern similar to that of rubber; they may be mixed with rubber to improve its ozone and acid resistance; spheres of polybutene at room temperature do not bounce, but elevating the temperature to 100° C. produces rebound close to that of rubber. As rubber and polybutene are physically similar but chemically dissimilar, a comparison of the two permits of conclusions concerning those properties for which unsaturation alone is responsible. Based on this comparison vulcanization, ozonization, and oxidation are manifestations of unsaturation.

The following physical properties of the higher molecular weight polybutenes closely resemble those of rubber and therefore appear to be largely independent of orientation due to carbon-double-bond-carbon configuration: tensile strength, elasticity, rebound, X-ray structure, electrical properties, elastic memory, fractional solubility, and mechanical orientation. W. J. Sparks, I. E. Lightbown, L. B. Turner, per K. Frolich, and C. A. Klebsattel, Standard Oil Development Co.

Catalytic Dehydrogenation of Monoölefins to Diolefins. Monoölefins have been dehydrogenated catalytically to give conjugated diolefins of the same carbon framework. The most satisfactory catalysts consist of chromium, molybdenum, or vanadium oxide on alumina. Since the reaction is favored by low pressures and high temperatures the conditions usually used were 0.25 atmosphere or less and 600° to 650° C. The diolefins formed were butadiene-1,3 from n-butylenes; isoprene from 3-methylbutene-1 and from a mixture of 2-methylbutene-1 and 2-methylbutene-2; and piperylene from pentene-2. The once-through yields varied from 20 to 30%; ultimate yields of butadiene-1,3 up to 80% were obtained. Cyclopentadiene was obtained by dehydrogenating cyclopentane. Aristid V. Grosse, J. C. Morrell, and Julian M. Mavity, Universal Oil Products Co.

Dielectric Constant of Rubber-Carbon Black Mixtures. A study has been made of the effect of the carbon black concentration, carbon black particle size, and frequency of the applied voltage upon the dielectric constant of vulcanized and unvulcanized rubber-carbon black mixtures.

The dielectric constant has been shown to increase with carbon black concentration, decrease with the frequency of the applied voltage and for a given black concentration and frequency, to increase very rapidly with decrease in particle radius when the particle radius is of the order of one-tenth micron or less.

These observations have been explained with the assumption that the interparticle distances must be sufficiently small to allow interaction of the fields of activity surrounding adjacent particles. This interpretation is in agreement with the observations of Freundlich and of Kallman and Willstatter. C. M. Doede, Connecticut Hard Rubber Co.

Practical Evaluation of Commercial Rubber Carbon Blacks by X-Ray Diffraction. The ultimate particle sizes of 13 carbon blacks commonly used in the rubber industry were determined by both the Laue and Scherrer methods (the latter modified to a wedge sample procedure). In addition, the particle sizes of 5 other commercial blacks were determined by the Scherrer method alone. All particles were found to have dimensions lying in the ranges: 12.56 A. to 20.98 A. for the 002 direction, 12.91 A. to 25.32 A. for the 100 direction.

The particles of all samples investigated were almost equidimensional in shape and no extended shapes such as long needles or flat plates were noted.

Good checks of particle size data were obtained in all cases where the Laue values were compared with the results of the Scherrer method. Coupled with the facts that the wedge samples gave slightly more distinct and consequently more easily measured patterns, that the technique of the wedge method is much simpler to employ than that of the Laue method, and that the calculations of the former are much more readily carried out than those of the latter, these checks argue in favor of the use of the 30° wedge and Scherrer camera for carbon black work.

Evidence was presented to show the inadequacy of the microscopic method for particle size determinations of carbon blacks if the investigator is concerned with the size of ultimate particles rather than secondary aggregates.

The average number of primary particles per secondary aggregate was calculated for 5 samples of carbon blacks. These numbers ranged approximately from 10^2 to 10^7.

The method of evaluating particle size in the blacks is extended to rubber mixes, in which the difficulty arises that the diffraction halo for rubber interferes with the strong 002 interference of the black. However, the 100 interference may still be used and since most of the blacks have essentially equidimensional particles, the single determinations suffice for an approximation. Removal of the rubber by swelling, refluxing, and solution, and separation of the black by high-speed centrifuging permits resolution of the 002 interference.

Besides particle sizes parallel data are given and compared on 13 black samples for apparent density, particle area, total surface in square meters per gram, active surface from methylene blue adsorption, and diphenyl guanidine adsorption; and data for cured tread stocks containing these blacks on tensile strength, 400% modulus, and Shore durometer readings. G. L. Clark and H. D. Rhodes, Department of Chemistry, University of Illinois.

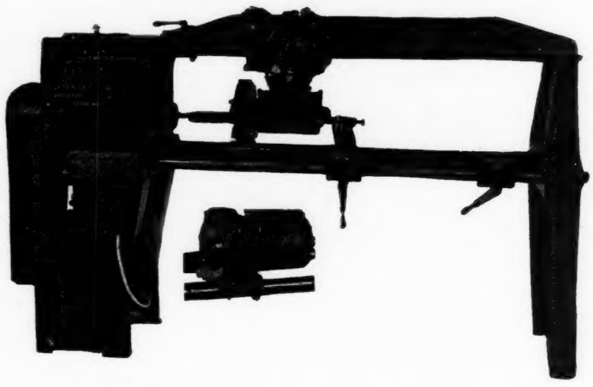
Statistical Theory of the Elastic and Thermoelastic Properties of Vulcanized Rubber. A statistical theory of the elasticity of rubber and similar high molecular compounds was put forward by the author several years ago. A further development of the theory applied to vulcanizates yields the dependency of the stress upon temperature and elongation for both extension and compression. No arbitrary constants, except a scale factor, enter into the theoretical formula. It is shown that the statistical theory holds also for hindered rotation, in addition to completely free rotation. The structure of vulcanizates assumed is that of long-chain molecules interlinked by cross-bonds (primary or secondary valences) to a three-dimensional network. The crossbonds may be sulphur bridges, but this is not a requirement. The experimental evidence concerning the dependency of the stress upon temperature and upon both extension and compression is in agreement with the theory. Eugene Guth, University of Notre Dame, Department of Physics.

A New Method for Measurement of the Permeability of Rubber to Various Gases. The processes of permeation of a gas through a sheet, and absorption by a block are analyzed and compared. The same factors, solubility and diffusion constant, are shown to govern rate of permeation and rate of absorption, and a method is given for assessing both of these factors independently by following the absorption of gas by a block. From the results, the permeability of a sheet can be deduced. The method eliminates difficulties and errors of the direct method and trustworthy, accurately reproducible results are obtained. Apparatus suitable for the purpose is described and some experimental results are recorded. A. S. Carpenter and D. F. Twiss, Dunlop.

The Dynamic Fatigue Life of Rubber. The gradual deterioration and final rupture of a rubber member due to mechanical vibrations imposed on it is called dynamic fatigue. Mention has previously been made in the literature that the dynamic fatigue life of rubber is less when the minimum of the oscillation cycle falls near zero strain; but heretofore no complete study, as given in the present paper, has been pub-

(*Continued on page* 48)

New Machines and Appliances



Improved 4-LM Grinder and Polisher for Rollers and Tubes

Roller and Tube Grinding Machine

A DUAL-PURPOSE machine of improved design rapidly and accurately grinds and polishes: small rubber rollers and tubes from which washers or gaskets are usually cut, wringer rollers, typewriter platens, printers' rollers, and other small rollers. The machine, identified as the 4-LM, provides for a wide variety of high speeds for automatic polishing and for an equal number of suitable speeds for grinding; the change-over from grinding and polishing is rapidly accomplished.

Grinding or polishing may be done either on centers or on journals; the maximum length between centers is 46 inches and between journal supports, 44 inches. The minimum diameter of work accommodated is ½-inch, and the maximum, eight inches. Accuracy in grinding and polishing is enabled by micrometer adjustments; while means are provided for automatically obtaining one or more passes of the grinding wheel across the face of the work.

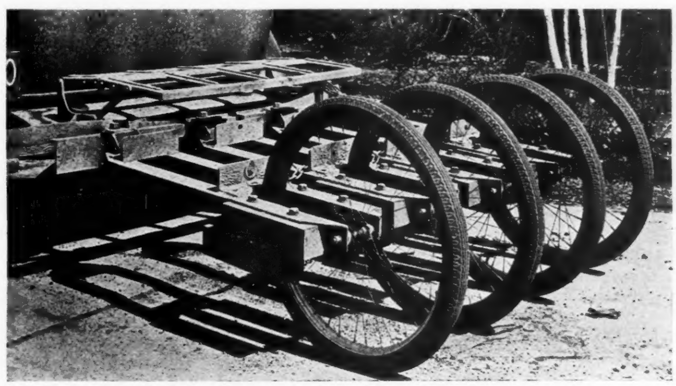
Power is supplied by two motors, one for driving the work and the other for grinding purposes; the two motors consume approximately four h.p. The mechanism in the head of the machine runs in oil. Weighing 2,300 pounds, the machine is five feet high and occupies a floor space of two feet, ten inches, by eight feet, six inches. The Black Rock Mfg. Co., Bridgeport, Conn.

Twin-Cylinder Tuber

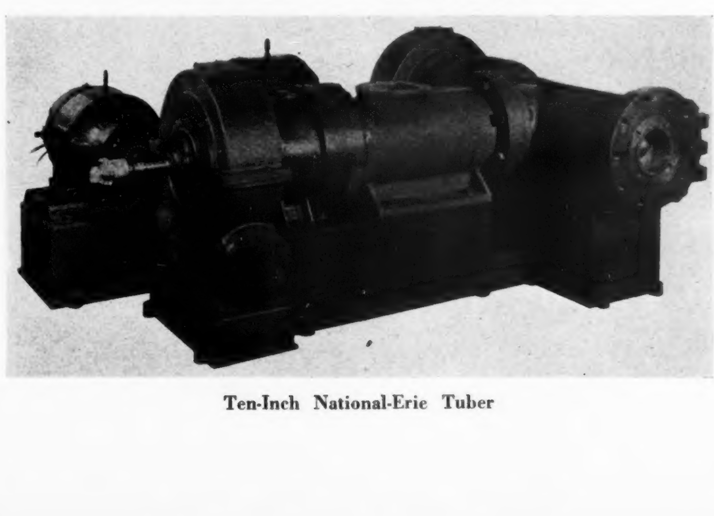
RUBBER or plastic compounds fed into the feeding cylinder of a new twin-cylinder tubing machine are said to be plasticized and thoroughly mixed before entering the extruding cylinder. The machine, which is made in cylinder sizes of from two to ten inches in diameter, utilizes special steels at all hard wearing points. A special steel lining is used throughout, from the feed box to the delivery end; while the stock screws are cut from alloy steel forgings and hollow bored for water circulation. Threads of the stock screws are hardened the entire length. Thrust bearings are of the heavy-duty roller type, and radial bearings are lubricated with grease or oil. The housing has hand hole openings for the quick inspection of bearings. National-Erie Corp., Erie, Pa.

Bicycle Tire Test Equipment

TWO machines, one for road tests and the other for laboratory check-ups, have recently been developed to insure the serviceability of bicycle tires. On one machine, comprising a trailer hooked to the rear of an automobile, four tires are road tested simultaneously, each tire being under an individual load of 125 pounds. A similar indoor test consists of running the tires 24 hours daily against revolving wheels with flat faces. The speed in this case corresponds to a road speed of 20 miles per hour. The test room temperature is approximately 100° F., and the load is again 125 pounds. Tires are tested both at normal inflation pressures as well as at over and under inflation pressures. The Fisk Tire Co.



Fisk Auto Trailer for Wear-Testing Bicycle Tires



Ten-Inch National-Erie Tuber

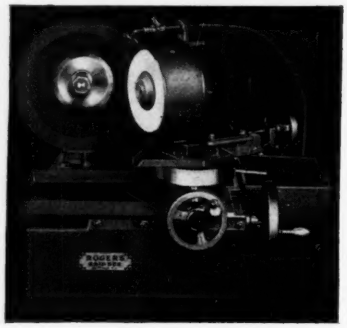
Welders' Goggles

THE Speedframe consists of welders' goggles mounted in a light weight, comfortable fiber headframe, so designed that a simple nod of the head positions the goggles in front of the eyes or a nod will throw them up and out of the way. The goggles remain in either position without further adjustment, assuring uninterrupted use of both hands. The assembly is fully adjustable in three directions by side and top straps and is held in desired adjustment by a simple screw-type clamp. Mine Safety Appliances Co.

Speedframe Goggles

Circular Knife Grinder

A PRECISION knife grinder for single- or double-bevel circular knives of from one inch to eight inches in diameter comprises a grinding wheel placed on an enclosed direct motor-driven arbor mounted on ball bearings. The motor may be swiveled horizontally for grinding at any desired angle. The knife, which is rotated by a separate motor through a V-belt, is mounted on a suitable arbor. Adjustments for grinding operations are provided by three slides with hand-wheel screw controls. A wet-grinding attachment is supplied which consists of a tank, centrifugal pump, pipings, and petcock; the pump is driven by the same motor as is used for rotating the grinding wheel. The machine, which weighs about 300 pounds, is entirely self-contained with control switches conveniently mounted on the motors. Larger machines will accommodate knives up to 14 inches and 20 inches in diameter. Samuel C. Rogers & Co.



Precision Knife Grinder

Rubber Division

(*Continued from page* 46)

lished in which the fatigue lives of rubber as a function of the oscillation stroke are examined for minimum distortions varying from high compressions through all possible elongations.

The general dynamic fatigue characteristics of rubber in linear vibration in a dark, dry enclosure are (L_{min} = minimum length during the vibration; L_0 = free unstrained length): (1) For a given oscillation stroke the dynamic fatigue life is a minimum when $L_{min} = L_0$; (2) For a constant value of L_{min} the dynamic fatigue life decreases as the oscillation stroke increases; (3) For given strain limits of oscillation the dynamic fatigue life is usually lower the harder the stock; (4) The dynamic fatigue life depends critically on the rubber temperature.

It is shown that the dynamic fatigue life of rubber worked in shear can be related in a qualitative way to the dynamic fatigue life of rubber vibrated through linear strains. S. M. Cadwell, R. A. Merrill, C. M. Sloman, and F. L. Yost, U. S. Rubber.

The Analysis of Rubber for Antioxidants. The technique of quantitative antioxidant analysis which employs a turpentine oxidation method is covered in detail. The relations between the amount of antioxidant present in acetone extracts of the rubber compounds and the induction period in the turpentine oxidation reaction have been worked out and applied to antioxidant determinations in rubber. Certain qualitative tests are also given for the detection of antioxidants in a tire tread vulcanizate. L. H. Howland and E. J. Hart, U. S. Rubber.

The Chloroform Extract of Reclaimed Rubber. The effect of the various operations in the reclaiming process on the magnitude of the chloroform extract of reclaimed rubber is discussed. The chloroform extract of any given reclaim is increased by: (1) longer time of heat treatment at a given temperature; (2) increase in temperature of heat treatment; (3) decrease in refining temperature; and (4) increase in number of passes through a refiner.

An increased chloroform extract means greater softness and plasticity for any given reclaim, but different types of reclaim with equivalent chloroform extracts may have widely different plasticities.

The use of oils as plasticizers in preference to excessive heat plasticization is desirable in producing many types of reclaimed rubber.

A high chloroform extract is not a criterion of improved quality; a performance test must be used. A specification for chloroform extract determination is given. Henry F. Palmer and F. L. Kilbourne, Jr., Xylos Rubber Co.

Los Angeles Group

THE annual fishing trip of the Los Angeles Group, Rubber Division, A.C.S., held off Catalina Island, Calif., August 11 and 12, was a distinct success, largely through the efforts of W. C. Holmes, chairman of the program committee. After dinner at the California Yacht Club, Wilmington, on August 11, the group of 42 embarked on the *S. S. Retreat* with Captain Dick Crank at the helm and then proceeded to Catalina Island where about half of the group went ashore to sleep in Villa Park at Avalon. The group embarked again at five a.m. on Saturday morning, cruising along the coast of the island. Breakfast of coffee and ham sandwiches was furnished by E. Royal, of the H. M. Royal Co. Fishing was said to be somewhat better than at San Diego last year, and several yellowtail and a number of barracuda were caught. Most members, however, had to be content to bring in rock bass. The trip ended with the boat's return to Wilmington Saturday afternoon.

Prizes donated during the return trip were made available by the following concerns: American Cyanamid & Chemical Corp.; Blue Star Mines, Inc.; Dill Mfg. Co.; E. I. du Pont de Nemours & Co., Inc.; J. M. Huber, Inc.; Johnson Steel & Wire Co.; Los Angeles Group; H. Muehlstein & Co., Inc.; Pacific Coast Talc Co.; H. M. Royal & Co.; San Francisco Sulphur Co.; A. Schrader's Son; West American Rubber Co.; and Western Shade Cloth Co.

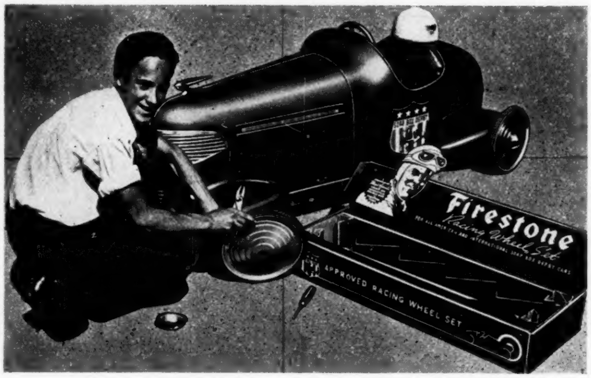
New Huber Clays

Two new clays, Barden and Chicora, have recently been announced by J. M. Huber, Inc., 460 W. 34th St., New York, N. Y. Suprex clay remains the company's leading standard for the rubber industry, and it is recommended for general use where a reenforcing type of clay is indicated. Barden clay develops a higher tensile strength and abrasion resistance, but at some sacrifice in modulus. Chicora clay develops a distinctly higher modulus in rubber compounds than either Suprex or Barden, but with somewhat lower tensile strength and abrasion resistance. Two other clays are produced by Huber: Paragon, a fast curing type, but of the so-called "soft" or semi-reenforcing nature; and Hi-White, another soft type characterized by exceptional whiteness and fast extrusion rate.

pH Apparatus Standards

A new series of reference standards, known as Hydrion Buffer Capsules, for checking electrometric pH apparatus, is made up in the form of powder, standardized and packaged in capsules

New Goods and Specialties



Soap Box Derby Entrant Equipping Racer with Firestone Wheel Set

Racing Wheel Set

A NEW axle-wheel-and-tire racing set has recently been introduced for use on the minature racing cars which participate in the American Soap Box Derby. The new equipment has been inspected and approved by the Technical Committee of the National Soap Box Derby, Inc.

The solid narrow tires are circular-molded into seamless units. A clincher-type wheel rim construction eliminates the heavy wire binding that had been used previously to hold the rubber tread together. The steel wheel is equipped with ball bearings; while the axle is constructed so as to preclude bending of the wheels or axles. Reduction of frontal area by use of a narrow wheel and tire is said to lessen wind resistance. Firestone Tire & Rubber Co.

Snake-Bite Suction Kit

TWO soft rubber suction cups which telescope into each other, together with iodine, a lancet, and a tourniquet, provide a compact snake-bite kit, scarcely larger than a shot gun shell. The suction treatment, when properly and promptly instituted, is said to reduce mortality to less than 2%. One suction cup is for flat surfaces, and the other for fingers, toes, shins, etc. Cutter Laboratories.

Latex Tubing

SURGICAL tubing, made of pure latex by the Anode process, is now being produced in continuous 50-foot lengths. There are two sizes, ¼- and $\frac{5}{16}$-inch inside diameter, each with a $\frac{1}{16}$-inch wall. The new tubing, which has a soft, silk-like finish, is translucent, with the fluid level always visible. Advantages claimed for this new development include: availability of any continuous length of pure gum tubing up to 50 feet without splicing; uniformity of size and wall strength. A specially devised package allows the tubing to be wound tier upon tier upon an easy turning reel. The package lid locks the reel in place and prevents the tubing from unwinding while in storage. Miller Rubber Co., Inc., Akron, O.

Upholstery and Rug Materials

A NEW and revolutionary transformation of "Cavalon" rubberized fabric, originally designed as a leather-like upholstery for heavy duty trucks, into a lighter weight material for furniture, has recently been announced after four years of development in the laboratory. "Cavalon" is waterproof and washable. It is immune to perspiration, and rain or damp weather will not impair the finish which is said to withstand severe scratching and scuffing. One hundred buses specially constructed for the New York World's Fair are upholstered in the rubberized fabric, which oddly enough neither smells, feels, nor looks like rubber.

A new use for "Velvetex," originally developed as a sponge rubber rug cushion or underlay, is as a floor covering in its own right. The du Pont exhibits at the San Francisco and New York fairs have been chosen as a proving ground for this new application. "Velvetex" is said to be soft, springy, restful to the tread, and practically soundproof. E. I. du Pont de Nemours & Co., Inc., "Fabrikoid" Division, Empire State Bldg., New York, N. Y.

Compact Snake-Bite Kit

Water-Tight Pouch

A RUBBER pouch that is insect-, water-, and air-tight is known as Keepa. The container, six inches deep and three inches wide, has an elliptical plastic cover held securely in place by the elasticity of the rubber. Pioneer Rubber Co.

Sand Tire

THE new All-Weather Sand Type of tire is recommended for vehicles operating exclusively in deserts or other soft soil conditions where both flotation and tread design traction are required. This tire has an exceptionally wide tread which permits operation over soft sand with a minimum amount of penetration. Goodyear Tire & Rubber Co.

Goodyear Sand Tire

Rubber Industry in America

FINANCIAL

Unless otherwise stated, the results of operations of the following companies are after deductions for operating expenses, normal federal income taxes, depreciation, and other charges, but before provision for federal surtax on undistributed earnings. Most of the figures are subject to final adjustments.

American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., and subsidiaries. First half, 1939: net income, $2,149,714 after depreciation, depletion, income tax, and other charges, equal after dividend requirements on the preferred stock, to 80¢ a share on 2,618,369 common shares, against $524,649, or 19¢ a common share in the first half of 1938.

American Zinc, Lead & Smelting Co., Columbus, O., and wholly owned subsidiaries. June quarter: net profit, $41,384, equal to 62¢ each on 66,553 shares of $5 convertible prior preferred stock, against $44,769, or 67¢ a share on preferred, in March quarter and net loss of $64,687 in June quarter of 1938. Year ended June 30: net profit, $84,519, equal to $1.27 a share on preferred, against net loss of $40,308 in the year ended June 30, 1938.

Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y., and subsidiaries. June quarter: net profit after obsolescence, $131,293, equal to 31¢ each on 421,981 capital shares, against net loss of $77,161 in the March quarter and $172,343 loss in the June quarter last year.

Baldwin Rubber Co., Pontiac, Mich. June quarter: net profit, $28,488, equal to 9¢ each on 316,757 capital shares, against $120,559, or 38¢ a share, in the March quarter and net loss of $17,542 in the June quarter of 1938. Nine months to June 30: net profit, $305,890, equal to 96¢ a share, against $24,740, or 8¢ a share, for the nine months to June 30, 1938.

Columbian Carbon Co., 41 E. 42nd St., New York, N. Y., and subsidiaries. First half, 1939: net profit, $1,633,599, after depreciation and depletion, federal taxes, interest, and other charges and is equal to $3.04 on each of 537,406 shares of common stock, compared with a net profit of $1,377,072, or $2.56 a share, on the common stock, in the first half of 1938. Current assets on June 30 amounted to $7,125,298, including $3,993,254 in cash and marketable securities at cost, and current liabilities were $841,006, contrasted with current assets of $6,114,337, including cash and marketable securities of $2,951,040, and current liabilities of $1,155,261 on June 30, 1938.

De Vilbiss Co., Toledo, O. For 1938: net income, $205,853, equal, after preferred dividends, to $1.68 each on 98,641 common shares, against $531,196 or $4.98 a common share on 98,616 shares in 1937.

Detroit Gasket & Mfg. Co., Detroit, Mich. First half, 1939: net profit, $241,103, equal, after preferred dividends, to 99¢ each on 214,250 shares of $1-par common stock, against net loss last year of $4,147. June quarter: net profit, $113,093, or 46¢ a common share, against $18,660, or 1¢ a share on common, in the June quarter of 1938.

Dewey & Almy Chemical Co., Cambridge, Mass. First half, 1939: net profit, $247,906, equal after preferred dividend requirements, to $1 each on 191,775 common shares, against $77,621 in the first half of 1938.

Fisk Rubber Corp., Chicopee Falls, Mass. First half, 1939: net income, $401,018, after provision for federal taxes, reserve for fluctuation in prices of raw materials and other contingencies and other charges; equal after preferred dividends to 68¢ each on 439,923 shares of common stock. For the first half of 1938 net income was $172,298, after these charges, or 15¢ a common share after dividend requirements on the preferred stock.

Flintkote Co., 50 W. 50th St., New York, N. Y., and subsidiaries. Twenty-eight weeks to July 15: net income, $610,331, equal to 91¢ a share on 672,996 shares against $269,627, or 40¢ a share on 670,346 shares, last year. Sixteen weeks to July 15: net income, $507,837, or 75¢ a share, against $266,230, or 40¢ a share, in the 1938 period. Year ended July 15: net income, $1,152,522, equal to $1.71 a share, against $615,817, or 92¢ a share, in the 52 weeks to July 16, 1938. Net sales for the 28 weeks were $8,339,829, against $7,299,358 a year ago; for the 16 weeks, $5,489,711, against $4,466,174; and for the 52 weeks, $16,188,180, against $14,250,014.

Garlock Packing Co., Palmyra, N. Y. First half, 1939: net profit, $364,133, equal to $1.74 a share on 209,250 common shares outstanding, against $210,548, or $1 a share in the first half of 1938, after interest and amortization, provision for United States and Canadian taxes, depreciation, inventory adjustment, and all other charges.

General Cable Corp., 420 Lexington Ave., New York, N. Y. First half, 1939: net loss, $170,279, against one of $326,230 last year. June quarter: net profit, $26,494, after inventory adjustments, equal to 17¢ each on 150,000 shares of 7% cumulative preferred stock, against net loss in March quarter of $196,773 and $260,083 loss in June quarter a year ago.

General Motors Corp., Detroit, Mich. First half, 1939: consolidated net earnings, after all charges, taxes, and reserves, $100,992,531, equal after preferred dividend requirements to $2.24 a share on the 43,500,000 shares of common outstanding, against $33,020,019, or 66¢ a share in the first half of last year; and net sales, $739,400,883, against $522,777,124.

The B. F. Goodrich Co., Akron, O. First half, 1939: consolidated net profit, $3,122,728, after provision for depreciation, interest, and federal income taxes, contrasted with net loss of $209,551 for the corresponding period last year. This net profit, which includes a nonrecurring income of $415,188, is equal to $1.61 a share on the outstanding common stock, after the regular preferred dividend requirements. Net sales, $66,119,599, against $51,193,986 for the first half of 1938. Total current assets, $76,770,153; current liabilities, $12,059,458; net working capital, $64,710,695, or $3,839,219 higher than a year ago, and $1,598,491 higher than as of December 31, 1938.

Goodyear Tire & Rubber Co., Akron, O., and subsidiaries. First half, 1939: net sales, $95,756,419; net profits, $3,610,595, equal after depreciation, interest, equity in undistributed earnings of subsidiaries not wholly-owned, federal income taxes and other charges, and dividend requirements on 650,432 shares of $5 preferred stock, to 96¢ a share on 2,061,457 common shares, excluding treasury shares, against net profit of $1,669,828, or 2¢ a share on 2,059,060 common shares, for the first half of 1938; current assets, including $21,819,871 cash and Canadian government securities, $106,409,415; current liabilities, $7,596,480; contrasted with cash and Canadian government securities, $15,779,005, current assets, $106,118,140, and current liabilities, $9,206,682, on June 30, 1938.

Intercontinental Rubber Co., New York, N. Y., and subsidiaries. First half, 1939: net profit, $96,967, after shutdown expenses, equal to 16¢ each on 595,832 shares of no-par capital stock, excluding 172 shares in the company's treasury, against net loss of $77,777 in the first half of '38.

Jenkins Bros., 80 White St., New York, N. Y. First half, 1939: net profit, $42,984, against net profit of $31,246 for the first half of 1938.

Monsanto Chemical Co., St. Louis, Mo. Second quarter, 1939: net income, after all charges, $1,040,678, equivalent, after deductions for preferred dividend requirements and minority interests, to 72¢ a share on the 1,241,712 common shares outstanding on June 30, compared with net earnings for the second quarter of 1938 of $555,424, or 37½¢ a share on the 1,241,816 common shares then outstanding. First half of 1939: earnings, $2,280,577, equal to $1.60 a share after provision for preferred dividend requirements and minority interests, against $1,224,734, or 85¢ a share, for the first half of 1938. Sales for the first six months this year were approximately 30% better than in the first half of 1938. Second quarter sales held even in comparison with first quarter volume.

National Lead Co., 111 Broadway, New York, N. Y., and wholly owned domestic subsidiaries. First half, 1939: net income $3,017,957, after deductions for federal income taxes, depreciation and other charges, equal after dividend requirements on the preferred A and B stocks, to 66¢ each on the 3,095,100 shares of $10 par common stock, excluding 3,210 shares held as an investment, against $1,804,864, or 27¢ a common share in the first half of 1938.

New Jersey Zinc Co., 160 Front St., New York, N. Y. First half, 1939: net profit, $2,047,648 after deductions for taxes, depreciation, depletion, contingencies and other charges, equivalent to $1.04 each on the 1,963,264 shares of $25-par capital stock, against $1,386,858, or 70¢ a share, in the first half of 1938. Second quarter, 1939: net profit, $971,382, or 49¢ a share, compared with $1,076,266, or 55¢ a share, in the first quarter and $734,262, or 37¢ a share, in the second quarter of 1938.

Philadelphia Insulated Wire Co., Philadelphia, Pa. First half, 1939: net income, $49,915, equal to $9.98 each on 5,000 shares of $5.50 preferred stock, against $75,595, or $15.12 a preferred share, last year.

Raybestos-Manhattan, Inc., Passaic, N. J. First half, 1939: net income, $709,130.09, or $1.12 per share, after providing $351,917.23 for depreciation and $160,153.47 for federal and state income taxes, against a net loss of $302,351.30 after $372,878.54 for depreciation in the same period last year. Assets at June 30, 1939, totaled $18,064,322.75, including $9,326,973.21 of current assets, equivalent to 10.7 times the current liabilities. There was no banking or refunded debt or other capital obligations outstanding.

St. Joseph Lead Co., 250 Park Ave., New York, N. Y., and subsidiaries. First half, 1939: net profit, $1,415,028 after depreciation, depletion, federal income taxes, etc., equal to 72¢ a share on 1,955,680 shares, excluding 41,153 treasury shares, contrasted with $46,184, or 2¢ a share, in the first half of 1938; current and working assets as of June 30, 1939, including $4,208,344 cash, $13,481,190; current liabilities, $1,993,429; compared with cash, $1,527,572, U. S. government and other marketable securities, $987,754, current and working assets, $11,854,082, and current liabilities, $2,127,173, on June 30, 1938; inventories, $7,624,506 against $7,991,891.

Seiberling Rubber Co., Akron, O. Eight months to June 30: profit before federal income taxes, $591,705, against profit of $33,600 in same period of previous year; June profit before taxes, $106,648, compared with $50,964 in June, 1938; net sales for eight months to June 30, $6,268,478, 20.8% more than in the same months of 1938.

Dividends Declared

Company		Stock	Rate	Payable	Stock of Record
Boston Woven Hose & Rubber Co.		Com.	$1.00 resumed	Aug. 25	Aug. 24
Canadian Wire & Cable Co.		Pfd.	$1.62½ q.	Sept. 15	Aug. 31
Collins & Aikman Corp.		Com.	$0.25	Sept. 1	Aug. 18
Collins & Aikman Corp.		Pfd.	$1.25 q.	Sept. 1	Aug. 18
Dewey & Almy Chemical Co.		Com.	$0.25	Sept. 15	Sept. 1
Dewey & Almy Chemical Co.		Pfd.	$1.25 q.	Sept. 15	Sept. 1
Dewey & Almy Chemical Co.		B	$0.25	Sept. 15	Sept. 1
Dominion Textile Co.		Com.	$1.25 q.	Oct. 2	Sept. 15
Dominion Textile Co.		Pfd.	$1.75 q.	Oct. 16	Sept. 30
Faultless Rubber Co.		Com.	$0.25 q.	Oct. 1	Sept. 15
Firestone Tire & Rubber Co.		Pfd.	$1.50 q.	Sept. 1	Aug. 15
General Motors Corp.		Com.	$0.75	Sept. 12	Aug. 17
General Motors Corp.		Pfd.	$1.25 q.	Nov. 1	Oct. 9
Gillette Rubber Co.		Com.	$0.50	Sept. 20	Sept. 1
Hewitt Rubber Corp.		Com.	$0.25 irreg.	Sept. 15	Sept. 1
Hewitt Rubber Corp.		Com.	$0.25 q. increased	Sept. 15	Sept. 1
Master Tire & Rubber Corp.	$4	Pfd.	$2.00 s. initial	Aug. 31	Aug. 25
Master Tire & Rubber Corp.		Pfd.	$2.00 s. initial	Aug. 31	Aug. 25
Okonite Co.	6%	Pfd.	$1.50 q.	Sept. 1	Aug. 17
Pharis Tire & Rubber Co.		Com.	$0.15	Sept. 20	Sept. 5
Raybestos-Manhattan, Inc.		Com.	$0.25	Sept. 15	Aug. 31
United Elastic Corp.		Com.	$0.10	Sept. 23	Sept. 1
U. S. Rubber Reclaiming Co., Inc.	Pr.	Pfd.	$0.50 accum.	Sept. 1	Aug. 21

Skelly Oil Co., Chicago, Ill., and subsidiaries. June quarter: net income, $517,837, equal, after preferred dividend requirements, to 42¢ each on 995,348 shares of common stock, against $613,471, or 51¢ each on 1,003,949 shares, in same quarter of 1938. First half, 1939: net income, $756,918, equal to 57¢ a share, against $1,278,242, or $1.08 a common share, last year. Year ended June 30: net income, $2,128,731, or $1.75 a share, against $4,330,670, or $3.92 a common share, for the preceding fiscal year.

A. G. Spalding & Bros., 105 Nassau St., New York, N. Y. May and June, 1939: profit, $305,698 after depreciation, amortization, interest, and other charges, but before income taxes, against $38,969 in the same months of 1938; net sales, $2,785,894, against $2,968,123. Eight months ended with June: net profit, $288,677 after depreciation, amortization, interest, income taxes, and reserve of $50,000 for expenses of capital reorganization, against net loss of $377,151 after charges, but before income taxes, in the corresponding period last year.

Thermoid Co., Trenton, N. J., and domestic subsidiary. First half, 1939: net profit, $168,733, equal after dividend requirements on 39,956 shares of $10 par, $3 convertible preferred stock outstanding, on which is an accumulation of unpaid dividends, to 23¢ each on 476,388 shares of $1 par common stock, against a net loss of $79,632 in the first half of 1938.

United Carbon Co., Charleston, W. Va., and subsidiaries. First half, 1939: net profit, $840,861, equal after federal income taxes, depreciation, and depletion to $2.11 a share on 397,885 common shares, against net profit of $813,049, or $2.04 a share, in the first half of 1938. June quarter, 1939: net profit, $381,659, equal to 96¢ a common share, against net profit of $374,685, or 94¢ a share in the same quarter last year.

United States Rubber Co., 1790 Broadway, New York, N. Y. First half, 1939: net profit, $4,465,397, against net loss of $239,213 for the same period of 1938; net sales, $88,349,048, against $67,829,786 in the 1938 period; net earnings after providing for the six months' dividend on the 8% non-cumulative preferred stock, or $2,604,364, $1,861,033, equal to $1.18 a share on the 1,572,261 shares of common; consolidated earned surplus, $5,381,769 after March and June preferred dividend payments; current assets, $91,650,000, against $86,783,000 for the first half of last year; inventories, $51,741,000, against $60,304,000.

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. First half, 1939: net profit, $51,447, equal to 17¢ each on 296,442 shares of common stock, against net loss of $32,775 in the first half of 1938.

EASTERN AND SOUTHERN

ON THE whole business activity recently has been running at a better-than-seasonal rate, continuing the trend started in May; and barring unforeseen developments conditions are generally favorable for the third quarter. Footwear manufacturers are ending the period when fall shoe production usually reaches a peak; while cotton mill operations have been well maintained. Foreign demand for machine tools remains at high levels, and a gradual improvement has been noted in domestic orders.. Construction contract awards during the first half of 1939 were the highest since 1930; factors favor increased residential contracts for the balance of this year. Steel operations, contra-seasonally, are still gaining, hitting 63% capacity last month, highest since October, 1937, and this rise is expected to continue, especially as the automobile industry should soon be increasing orders for 1940 models. Moreover unemployment in the United States has been declining since February, with the June number of jobless the lowest since December, 1937.

The Seventeenth Exposition of Chemical Industries will be held at Grand Central Palace, New York, N. Y., the week of December 4. To date more than 300 exhibitors plan displays. The Student Course in Chemical Engineering, an established feature of this biennial affair, will again be presented with Prof. W. T. Read, dean of chemistry, Rutgers University, director of the course at previous expositions, once more in full charge. This course enables the selected college students who enroll to coordinate lectures by leading authorities with actual examination of the materials and chemical engineering equipment discussed.

The Automotive Trade Association Managers last month announced that the National Automobile Show would be held in New York, October 15 to 22.

National Industrial Advertisers Association will hold its seventeenth national conference and exposition at the Hotel New Yorker, New York, N. Y., September 20 to 23. As announced last month, several men in the rubber industry will act as leaders in the 11 industrial advertising clinics scheduled. Saturday, September 23, has been designated N.I.A.A. day at the New York World's Fair, where the association will study the modern methods of displaying and dramatizing industrial products utilized there. The exhibits to be visited include General Motors, Ford Motor Co., Firestone Tire & Rubber Co., Chrysler, B. F. Goodrich, General Electric, du Pont, the Glass Building, U. S. Steel, and the Railroads on Parade.

J. M. Huber, Inc., 460 W. 34th St., New York, N. Y., has completed and is operating a new clay mill at Huber, Ga., about 15 miles from Macon, at which the company's Hi-White clay is produced for use in white rubber goods. The new half-million dollar mill, which is equipped with the most modern machinery, is operated by the Sgoda Corp., a subsidiary of J. M. Huber, Inc. Prior to the completion of this mill the material from this new deposit of Kaolin or China clay, opened up early this year, was refined at the company's plant in Graniteville, S. C.

The Columbia Alkali Corp., Barberton, O., has announced the removal, effective September 1, of its executive sales offices to 30 Rockefeller Plaza, New York, N. Y.

J. M. Cranz Co., Inc., distributer of Hewitt Rubber products for western New York State, on August 1 moved to new and enlarged quarters with offices and display room at its plant at 1280 Main St., Buffalo, N. Y.

Better Business Bureau of New York City recently held a meeting to which were invited representatives of tire distributers and dealers and of newspapers and magazines in an effort to check what have been called exaggerated assertions of price reductions in automobile tire advertising. In consequence H. J. Kenner, general manager of the bureau, offered the following "code" of guides for greater accuracy in tire advertising: 1. No statement or representation shall be used in advertising merchandise or prices which has the capacity or tendency to mislead or deceive the consumer; 2. Price claims shall not be used which compare a special price of a tire with the list price, or former list price, of a higher (price) level; 3. Claims of any savings based on a manufacturer's list price for any brand and size of tire shall not be used when the list price is not the price at which such brand and size has usually sold at retail in this community.

United States Labor Department, Washington, D. C., recently announced the awarding of supply contracts by federal agencies, including: Navy, cable, Anaconda Wire & Cable Co., New York, N. Y., $13,510, and Crannel, Nugent & Kranzer, Inc., New York, $12,750, packing sheet rubber, Hamilton Rubber Mfg. Co., Trenton, N. J., indefinite amount; WPA, casing and tube repair, General Tire Co. of New York, $12,000; Agriculture, fire hose, United States Rubber Co., New York, $18,890; War, cable and reels, General Cable Corp., New York, $72,125, and John A. Roebling's Sons Co., New York, $42,663; TVA, insulated wire and cable, Phelps Dodge Copper Products Corp., New York, $31,932 (estimated).

Maurice S. Azulay, superintendent of the rubber products division of the Speed Products Corp., manufacturer of office specialties, 3718 Northern Blvd., Long Island City, N. Y., is sailing on the *Queen Mary* on September 6 for London, England, on a pleasure and business trip and expects to return in early October.

U. S. Tire Dealers Corp., 1790 Broadway, New York, N. Y., has transferred J. W. Shields, former manager, farm tire sales, to the Detroit, Mich., plant where he will engage in product development work and other activities connected with farm tire development and sales with tractor manufacturers.

Federal Trade Commission, Washington, D. C., has ordered Philadelphia Rubber Waste Co., Philadelphia, Pa., and Albert Schwartz, Isadore N. Engel, and Simon Sperberg, copartners, trading as Philco Rubber Co., Philco Rubber Sales Co., Philco Auto Supply, Philco Auto & Rubber Supply, and Philco Spark Plug Co., Washington, D. C., and Richmond, Va., to discontinue the unauthorized use of a well-known trade name in the sale and distribution of their merchandise. The commission finds that by labelling inner tubes, spark plugs, and repair parts for tires and tubes with the designation "Philco" and by using the term "Philco" in their trade names, the respondents had represented to the purchasing public that their products were manufactured by the Philadelphia Storage Battery Co., a firm which for many years has manufactured radios and other electrical devices and had used the trade name "Philco" long before its adoption by the respondents.

Hewitt Rubber Corp., Buffalo, N. Y., recently received an order from the British Government for 800,000 feet of hose for its Air Raids Precaution division, which is believed to be the world's largest single order for fire hose.

Carl L. Reed, export manager, The Kelly-Springfield Tire Co., Cumberland, Md., left the first week in August on a business visit to Hawaii, Philippine Islands, British Malaya, Siam, and other points in the Far East.

The Pennsylvania State Legislature recently enacted a law, effective September 1, declaring, "it shall be unlawful for any person to operate a vehicle on the highways with tires showing breaker strip, cushion gum or fabric;" and if within 48 hours after notification by a police officer of defective tires the motorist has not replaced them with good ones, he is liable to a fine of $10 and costs or, failing to pay this, five days in jail.

OHIO

AN ANALYSIS of the rubber and tire industry by Fenner & Beane indicates that earnings for 1939 as a whole should be markedly better than those of '38. Company financial statements from April on show large gains in earnings, as selling price and crude rubber cost relations have been particularly favorable. Recovery in demand for replacement tires, after a decade of shrinkage, has been a feature of the past year; while shipments of original equipment tires recovered sharply in the first half of 1939. Much, of course, depends on the automobile industry, for although rubber manufacturers have successfully developed new sales outlets, tire output in 1938 still accounted for 69.7% of annual crude rubber consumption; while the number of miscellaneous rubber articles involved in new auto production has risen markedly.

Firestone's India Plant

The Firestone Tire & Rubber Co., Akron, is constructing a plant at Bombay, India, which should start manufacturing by late fall, with a daily capacity of 400 tires and tubes and provision for expansion when required.

India, a part of the British Empire, has, up until now, imported most of its tire requirements from England. In the past decade India's development of roads and motor transport has been going on at an ever-accelerating pace. It has upwards of 300,000 miles of improved highways, and its use of trucks and buses as well as passenger cars has increased rapidly of late.

Firestone, established in India with sales and distributing facilities for twenty years, found its business growing steadily, having now reached such a volume that manufacturing facilities are deemed necessary.

This will be the seventh plant built by Firestone in foreign countries; the others, already in operation, are in Canada, England, Spain, Switzerland, Argentina, and South Africa.

Personnel Mention

Vice President L. R. Jackson has announced the appointment of D. J. Hutchins, formerly assistant sales manager in charge of truck and by-products sales of The Ford Motor Co., to the Firestone manufacturers' sales staff in Detroit, Mich., where he will be associated with H. M. Taylor, Detroit manager of the Firestone manufacturers' sales division, and with C. A. Jessup, manufacturers' sales representative. Mr. Hutchins will handle all products made by Firestone, including tires, mechanical rubber parts, Airtex products, plastics, and steel products.

The Firestone company shut down its Akron plants on August 4 so that its employes and their families could enjoy the Firestone Annual Outing at Euclid Beach, Cleveland, where events of the day included free amusements and refreshments, athletic sports, swimming, dancing, and entertainment.

The late Harvey S. Firestone, Sr., left an estate estimated at $2,922,434. After tax deductions and bequests to charity and various relatives and friends the balance of the estate will be divided equally among Mr. Firestone's five sons and one daughter. His widow received a life interest in the Akron estate.

Goodrich Activities

The B. F. Goodrich Co., Akron, has announced that Walter E. Head, manager of Time Study and Standards of the Tire & Miller plant divisions, recently was made production superintendent of the Los Angeles plant.

Walter W. Thomen, special field representative of the Goodrich original equipment tire division, effective August 1, has his headquarters in the Chicago district, announced G. E. Brunner, general sales manager of the division. For 10 years Mr. Thomen, who joined the company in 1929, handled leases for Goodrich stores throughout the country and was manager of the company's real estate department. He had been doing special field sales work for the original equipment tire division out of the Akron offices previous to his present appointment.

Thomas O'Callaghan, Jr., was made special eastern representative of Goodrich's manufacturers' sales division, in charge of all large truck-fleet accounts in the East, according to J. E. Powers, district manager.

John H. Vaughn, of Trenton, for the past twenty years with the footwear division of the United States Rubber Co., has joined Goodrich and been assigned temporarily to the company's footwear factory at Watertown, Mass. Later he will be assistant to the manager of the Philadelphia territory, which also includes Trenton. While affiliated with U. S. Rubber he covered New Jersey, eastern Pennsylvania, and Delaware.

A. D. Moss, director of all Goodrich purchases, recently marked his fortieth anniversary with the company.

To meet increasing demand for its Air Cell Sponge, Goodrich, according to J. H. Connors, vice president and general manager of the mechanical goods division, on September 1 raised its daily production capacity 200%.

Mats, Inc., manufacturer of 200 products including automotive rubber mountings, silencers, and insulators, tire patches, stair treads, rubber rugs and mats of all kinds, has transferred from Akron its office and sales department as well as the remainder of its manufacturing activities to Canton, where the firm was established in 1935 with 24 employes (it now has more than 150). Albert Buxbaum, president, and G. F. Duryee, vice president and general manager, reported an immediate 30% increase in production capacity with a further expansion program set for the near future. The firm's annual volume of manufactured products exceeds $500,000. The Buxbaum Co., sales agency for Mats, Inc., has its office at the local plant. Carl Rehm is office manager. The plant occupies the former Gordon Rubber Co. building at 1212 Seventh St. SW.

Goodyear News

The Goodyear Tire & Rubber Co., Akron, reports that the first tire built at its new plant in Brazil came out of the mold on July 13 and was shipped to Akron to be placed in the company's museum with other "first" tires from the outside plants.

The Annual Goodyear Frolic was held on July 31 at Euclid Beach Park, Cleveland, with record crowds in attendance. The usual program featured sports and games, band concerts, dancing, dining, and the awarding of prizes. Fred Colley was general chairman.

Many Goodyearites will participate in the excursion to the New York World's Fair, leaving Akron on September 14 and returning on September 17. Fred Colley is in charge of this affair.

Robert E. Lee, for the last five years superintendent at the Buenos Aires, Argentina, factory, was named division superintendent in charge of Plant I production in Akron, succeeding H. I. Belknap, who was made division superintendent in charge of the growing Airfoam division. Vice President C. C. Slusser announced that the new general superintendent at Argentina would be R. L. Patrick, head of the Goodyear Reclaim Plant for the past decade.

Giant Tires for South Pole Expedition

Goodyear last month announced production of its three hundred millionth pneumatic motor vehicle tire. Said to be the largest ever built for actual use on a motor vehicle, it is 10 feet in overall diameter, nearly a yard in cross-section, weighs 700 pounds, and is the first of six being constructed for the gigantic snow cruiser to be used by the forthcoming U. S. Antarctic expedition. This cruiser, claimed to be the largest motor vehicle ever made, will be 55 feet long, 15 feet wide, 15 feet high, weigh 75,000 pounds loaded, and carry a crew of four, fuel enough for 5,000 miles, and supplies for one year.

Tire No. 300,000,000 was taken from its mold in the presence of President Paul W. Litchfield and other Goodyear

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NEW JERSEY

BUSINESS continues to improve a little in the Trenton district, with manufacturers finding a better demand for all kinds of mechanical and hard rubber goods. Production of rubber athletic goods also has gained; while reclaimed rubber manufacturers report increased orders.

Pierce-Roberts Rubber Co., Trenton, is busy in all departments. Treasurer Clifford A. Pierce and Mrs. Pierce spent several weeks at Cape Cod.

Crescent Wire & Cable Co., Trenton, reported business is considerably better than during the past few months after an increase in prices had gone into effect.

Martindell Molding Co., Inc., which recently completed a new plant on the outskirts of Trenton, has begun operations on a small scale and expects to be running at full capacity soon. Thirty workers are now employed, and more will be engaged when new molds are completed. President Milton H. Martindell said he had many orders on hand and that prospects for the future were bright.

Jos. Stokes Rubber Co., Trenton, reported a good spring and summer season. Frank H. Tupper, formerly production manager of the Panelyte Corp., Trenton, has joined the Stokes sales division.

Thermoid Co., Trenton, instead of holding its usual annual picnic, took its employes and their families to the New York World's Fair on August 26. The company engaged special trains and paid the admission of the employes to the fair. About 2,500 made the trip. The day had been designated Thermoid Day at the fair. The company made arrangements for its workers to visit the General Motors, Ford, Goodrich, and Chrysler exhibits. The New Jersey building served as headquarters.

Luzerne Rubber Co., Trenton, is enjoying better business. President Bruce Bedford and Mrs. Bedford returned recently from a cruise to Quebec.

Pocono Co., Trenton, now operating five days a week with two shifts after a slack season, expects to continue busy throughout the fall.

Charles E. Stokes, Jr., vice president of the Home Rubber Co., Trenton, and Mrs. Stokes spent some time in New England.

Essex Rubber Co., Trenton, employes recently held its annual outing at the Trenton Fair Grounds with 700 in attendance. The company permitted plant inspection before the picnic, when visitors were privileged to go to any part of the factory and trained men were on hand to answer questions.

Whitehead Bros. Rubber Co., Trenton, announced a better business.

Nearpara Rubber Co., Trenton, finds a good pick-up in business with much demand for reclaimed rubber.

Mercer Rubber Co., Hamilton Square, reported business is improving, with a better demand for all mechanical goods.

MIDWEST

INSTEAD of the customary mid-summer lull the Midwest enjoyed well-maintained business activity, with the future outlook favorable. Employment and payrolls made a good showing. The rubber industry, however, represented by 34 firms, reported 11,455 wage earners receiving $270,000, a decline of 0.9% in the number of workers, but a gain of 5.1% in earnings over the previous month. The automobile industry is in its usual slack period with the shutdown of plants for model changes earlier than ever this year. Some factories already have production on 1940 models well under way.

Synthetic Rubber from Butane

A new way to make synthetic rubber has been developed by Universal Oil Products, Chicago, Ill., according to Gustav Egloff of that research organization. In the process butane is dehydrogenated to butadiene, which in turn can be polymerized into synthetic rubber by a number of methods. Butadiene rubber is being marketed in Germany under the name of Buna and is produced also in Russia. The raw material, butadiene, is rather expensive in these countries; while butane is relatively cheap. From oil fields and petroleum refining processes butane gas is available at present in quantities sufficient to make annually 10,000,000,000 pounds of rubber, it is claimed. Several companies in this country are considering installation of a butadiene-making process.

N. S. C. Congress

National Safety Council, Inc., 20 N. Wacker Dr., Chicago, Ill., will hold its twenty-eighth safety congress and exposition at Atlantic City, N. J., October 16 to 20. The Rubber Section program, scheduled for October 17 and 18, includes: Report of Committees, General Chairman R. A. Bullock, Corduroy Rubber Co.; "Carbon Tetrachloride in the Rubber Industry," H. A. Walker, Goodyear Tire & Rubber Co.; discussions led by C. W. Ufford, Ohio Rubber Co., J. T. Kidney, Goodyear, Wm. Spanton, American Hard Rubber Co.; "Progress of Safety in the Rubber Industry," Ernest W. Beck, United States Rubber Co.; "Prevention of Accidents in the Rubber Industry": "Handling Materials," D. G. Welch, Hewitt Rubber Corp., "Falls," R. M. Weimer, Dayton Rubber Mfg. Co., "Knife Cuts," A. M. Dietz, Pennsylvania Rubber Co., Inc.; "Rubber Section Safety Contest of 1938-39": "Outstanding Facts," Roland Kastell, U. S. Rubber, and presentation of awards; election of 1939-40 officers; "Safety and Product Quality in a Chemical Industry," Wm. G. Nelson, U. S. Rubber; "Dust in the Rubber Industry," P. A. Davis, Goodyear; "Training Supervision in Accident Prevention in the Rubber Industry," John J. Loge, General Tire & Rubber Co., and "Safety Kinks," R. S. Farnum, U. S. Rubber.

C. E. Johnson, it is reported, plans construction of a carbon black plant in the gas fields near Ada, Okla., at an estimated cost of $40,000.

Industrial Management Society, 205 W. Wacker Dr., Chicago, Ill., is sponsoring a National Motion & Time Study Clinic to be held at the Medinah Club, Chicago, on November 3 and 4.

NEW ENGLAND

INDUSTRIAL activity in New England is improving slowly, but surely. A recent report indicates that in the past three years the amount of available industrial floor space has been reduced from 63,000,000 square feet to 31,000,000 square feet, largely by reoccupations, nearly half of which were properties sold to new concerns. Demolition of obsolete plants has also been extensive, but in the period under review about 7,500,000 square feet of new industrial space has been added to the New England plants, covering about 1,600 new structures and additions. Three years ago 677 industrial properties were unoccupied; today the number is 466.

Brockton Tool Co. acquired the plant formerly occupied by the Morse Machine Co., Central St., South Easton, Mass., and moved from 103 Belmont St., Brockton, Mass., to the new plant on June 1. The factory is a two and one-half story brick building with a separate office building. The location is four miles west of the center of Brockton near Morse's corner on Route 138, the main highway between Boston and Tauton, Mass. The company is under the same management, and officers are Herbert H. Wydom, president, and Levi Holmes, treasurer.

United States Rubber Co., Naugatuck, Conn., plant of the Footwear Division, held its annual picnic on August 12 at Lake Quassapaug with an estimated attendance of 10,000. Athletic events, swimming, and numerous booths for the distribution of several hundred gate prizes featured the outing.

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OBITUARY

Carl Mosier

CARL MOSIER, vice president in direct supervision of factory, Union Asbestos & Rubber Co., Cicero, Ill., died of a heart attack on July 17. Born in Oshkosh, Wis., on April 18, 1888, he attended local grade and high schools and business college and for about ten years was connected with Chicago railroads. Then in 1915 he became associated with L. L. Cohen, at that time forming the Union Asbestos & Rubber Co. Mr. Mosier was made secretary-treasurer and in 1929 he was appointed vice president.

Interested in golf and fishing, he belonged to the Ridgemoor Country Club.

His wife, twin daughters, and a son survive him.

Funeral services were held at St. Giles Church, Oak Park, Ill., July 20, and burial was in Mt. Carmel Cemetery, Hillside, Ill.

Frank B. Myers

FRANK B. MYERS, of Trenton, N. J., superintendent of the former Zee Zee Rubber Co., Yardville, N. J., died July 19 from a heart attack. He is survived by his wife, two sons, and a daughter.

Walter Goodyear

WALTER GOODYEAR, 73, grandson of the inventor Charles Goodyear, died suddenly, July 30, while walking near his home, 327 W. 56th St., New York, N. Y. The deceased was not connected with the rubber industry, but had run a book shop until his retirement several years ago. He is survived by his wife and a son.

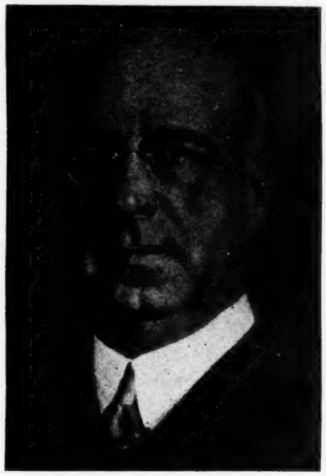
Edward C. Conlin

EDWARD CHARLES CONLIN, noted tennis player, rules maker, and umpire, died at his home in New York on August 21. He had joined United States Rubber Co., 1790 Broadway, New York, in 1924 to use his experience in the development of a new line of sport goods, after which he became manager of golf ball sales. Mr. Conlin resigned on April 1, 1939, because of ill health.

He was born in New York 61 years ago and joined the Munsey publications about 1906, later becoming advertising manager, where he remained until going to U. S. Rubber. The deceased was a founder of the Tennis Umpires Association, a vice president of the Golf Ball Manufacturers Association, and a life member of the West Side Tennis Club.

His survivors include his wife and a son and a daughter by a former marriage.

The funeral was on August 23.



A. H. Canfield

A. H. Canfield

AFTER a lengthy illness Albert Homer Canfield, president of The H. O. Canfield Co., manufacturer of mechanical rubber goods, Bridgeport, Conn., since 1910, died on August 3. He was the last male member of a family associated with the rubber industry for a century.

He was born in Pekin, Ill., September 19, 1875, but his family moved to Bridgeport in 1884. Mr. Canfield attended the local grade and high schools, Park Ave. Institute, Peekskill Military Academy, Cascadilla School, and Cornell University for two years.

Then his father, who was head of the company at the time, made him a traveling representative to gain experience. After a few years Albert Canfield returned to the factory, becoming successively foreman of each of the departments, vice president when the concern was incorporated in 1904, and president upon his father's death.

Mr. Canfield was appointed Fire Commissioner of Bridgeport and served as president of the board for several years, was a member of the Board of Apportionment, and was on the former Board of Contract and Supply. He also belonged to Masonic organization and the Brooklawn Country, Algonquin, Fish and Game, Fairfield Hunt, and Black Rock clubs.

He leaves his wife and a daughter.

Private funeral services were held on August 5. Interment was in Mountain Grove Cemetery.

William S. Curran

WILLIAM S. CURRAN, for the past 30 years with the Davol Rubber Co., Providence, R. I., died August 13 after a long illness. His survivors include his wife, one daughter, one son, two brothers, and two sisters.

Thomas F. Austin

THOMAS F. AUSTIN, for nearly a quarter-century with the Washburn Wire Works, Phillipsdale, East Providence, R. I., died on July 25. He was born at Providence, February 5, 1879, and belonged to the Masons, and the Providence Chamber of Commerce. He is survived by his wife, a brother, and a sister.

Frank H. Painter

FRANK H. PAINTER, for 25 years superintendent of the Hope Webbing Co., Pawtucket, R. I., until his retirement in 1934, died August 11 after a brief illness. He had been associated with the company 31 years. He was born in Easthampton, Mass., 68 years ago. He leaves his wife, two daughters, two sons, a granddaughter, and a brother.

Ohio

(*Continued from page 53*)

officials; Dr. Thomas C. Poulter, designer of the snow cruiser, scientific director of the Research Foundation of Armour Institute of Technology, and second in command to Admiral Byrd on the expedition; and other notables.

While this tire was being cured, Goodyear statisticians figured that if the 300,000,000 pneumatic motor vehicle tires built by the company were laid tangent to each other, they would form a line more than 150,000 miles long, or more than enough to girdle the earth six times.

Seiberling Rubber Co., Barberton, has awarded a contract for the erection of a one-story warehouse to cost about $45,000 for its branch at 120 Eleventh St., San Francisco, Calif.

The General Tire & Rubber Co., Akron, recently had as a visitor of its export department H. Lange, manager of the technical department of a century-old firm of exporters and importers at Hong Kong, which is an active distributer of General tires in China. T. Spencer Shore, treasurer of General Tire, recently was elected a director of Standard Steel Spring Co., Coraopolis, Pa.

Morenci Rubber Products recently bought the equipment and took over the business of The Reliable Rubber Co., 3124 Bellevue Rd., Toledo, which discontinued business on April 1 after five years of continuous operation. Morenci will continue the same line of manufacture, which includes household and molded goods, golf tees, driving mats, and tubing.

Rubber Industry in Europe

GREAT BRITAIN

Imports and Exports

Comparative statistics of Great Britain's rubber trade during the first half of 1939 reveal increased business in most lines of manufactured rubber, but a sharp drop in imports of crude rubber: 1,239,473 centals of 100 pounds, against 2,336,421 centals in the first half of 1938. The amount of crude rubber retained in the 1939 period is still further decreased by the larger re-exports which were 468,615 against 302,103 centals. Imports of gutta percha and balata were 12,777 centals, against 11,025 centals; of waste, reclaimed, and substitute, 40,334, against 43,234 centals. Exports of waste were 155,080 against 272,609 centals.

Exports of automobile tires increased from 584,357 units, value £1,302,483, to 675,103 units, value £1,458,500. Tire shipments to most British countries have been increasing, especially to New Zealand, which took about 70% more than in the 1938 period. South Africa's share has also been increasing regularly, if more slowly, despite the development of local tire factories, but the exact opposite is the case for India.

Of the foreign countries, Denmark continues to be Britain's best customer for tires and increased its share in 1939; but business with France and Argentine fell steeply. Exports of cycle tires came to 2,157,257, against 1,627,974 units, and tubes, to 1,600,712, against 1,347,802 units.

Imports of footwear made wholly or partly of rubber continued to increase and were 723,734 dozen pairs, value £619,658, against 616,879 dozen pairs, value £482,715. Exports of these goods were 29,785 dozen pairs, value £51,576, against 28,664 dozen pairs, value £43,468. Other exports included rubber and canvas belting, £148,592, against £151,578; piping and tubing, £108,455, against £113,263; elastic cords, braids, webs, and fabrics, £86,808, against £81,649; waterproofed apparel, £148,581, against £138,334; sheets, sheeting, and threads, £112,863, against £98,685.

Microporous Films

According to a process developed by W. Binns (B.P. 502,733) microporous films, skins, and coatings are prepared as follows. Dispersions of rubber (or aqueous dispersions of natural and synthetic resins, cellulose and cellulose derivatives, drying oils, etc.) are whipped to a smooth cream-like foam and spread on to a support; next is added a substance such as: finely divided wool, rayon, cotton, jute, or hemp; or talc, calcium sulphate, or mixtures of these. The foam is then collapsed to the desired thickness by means of light mechanical pressure, and it is heated or otherwise treated to set by coagulation. A coating of paint, lacquer, varnish, or the like may be applied to the set film or skin.

When rubber dispersion is used, it is advisable to incorporate a polymerized aldehyde so that by heating the foam to slightly above 100° C., for instance, the serum may be segregated before the foam is collapsed.

The main use of this invention is to produce coatings on the backs of woven or knitted fur fabrics to make imitation pelts or skin. The foam may also be applied to porous molds to produce microporous sheets, gloves, etc.

Notes

At a meeting of the General Council of the Institution of the Rubber Industry in London, July 11, the president, Sir Walrond Sinclair, proposed the reelection of F. D. Ascoli as chairman of the council. The recommendations of the examinations board were adopted, and the following diploma members elected: Fellows: C. H. Birkett, Wilfred Bowder, H. Skellom; Associates (General Rubber Technology): C. H. J. Avon, R. H. Hargreaves, J. W. Malden, and R. W. G. Roberts; Associates (Science): R. B. F. F. Clarke and R. J. Tudor.

A new type of rubber linoleum is to be produced at a factory, with a capacity of 600,000 yards per annum, at Arbroath, it is reported.

Rubber is now being used by the de Haviland Aircraft Co., Ltd., for reenforcing plywood, *Plastics* learns. The wings of the new Moth Minor are said to use two layers of plywood with a thick layer of "aerated vulcanite" between them.

The laboratories of the Research Association of British Rubber Manufacturers, including a new electrical laboratory, have been approved by the Aeronautical Inspection Directorate of the Air Ministry. The Research Association may now carry out electrical tests on soft and hard rubber supplies for the Air Ministry, and results will be recognized as a deciding factor in accepting goods.

A new type of waterproof paper has been put on the market by W. K. Thomas & Co., London, in which the pitch lining generally used has been replaced by rubber. Paper so treated is said to have increased resistance to heat and rain and is at the same time more pliable and less easily cracked. The paper is used as railway truck sheeting, for wall coverings, and as covering for concrete during "curing."

In connection with precautions to be taken during air-raids it is recommended to spray rubber latex on the outside of factory windows to prevent reflection of moonlight by the glass.

FRANCE

During the first half of 1939, France exported 44,906 metric quintals of pneumatic tire casings, sending about two-thirds to French colonies and the balance chiefly to Europe, especially Holland. Exports to Netherland India declined sharply in the early months of 1939 as compared with 1938, but a striking recovery occurred in May and June when totals were higher than ever.

The Société Anonyme Bata declared a 5% dividend for 1938. The name of the firm will be changed to Société Lorraine de Chaussures, Procédés Bata.

Etablissements Hutchinson for the past business year reported net profits of 11,363,163 francs, to which were added the carry-forward from the preceding year of 3,331,461 francs. The dividend was fixed at 75 francs.

BELGIUM

The Belgian Syndicate of Rubber Goods Manufacturers, of Brussels and Liege, have applied to the government to take measures to control the production of rubber goods, including automobile, motorcycle, and bicycle tires and tubes, repair accessories, belting, hose, rubber mats, footwear, industrial and molded goods and parts, toys, ebonite, etc., but not rubberized clothing, asbestos, and cables. Members of this syndicate have already voluntarily agreed for a period ending July 1, 1941, to limit output to 75% of capacity of existing plant in working order, and not to extend plant, except for replacement of old machinery. The organization now wishes to see these obligations extended to all non-member rubber goods factories and also desires prohibition of new undertakings without special government permit.

Belgium exported 477,000 automobile tires in 1938; in the first five months of 1939 the total was 182,000 tires, against 208,000 for the corresponding period of 1938, a 12.5% reduction.

GERMANY

Protective Coverings

Discussing protective coatings and linings made of natural and synthetic rubbers at the Corrosion Congress (1938) in Berlin, Dr. Hermann Meyer described a method of using Perbunan soft rubber in this way. The surface to be treated first receives several coats of a 15% solution of Pergut H in xylol. Before the last coat is dry, the Perbunan sheet is carefully applied, and the whole is allowed to rest for some hours before being vulcanized.

The synthetic rubbers are said to give more durable linings and coatings than natural rubber, especially when special mixes are used. For high temperature conditions Buna S is preferred; for benzine and oils of aliphatic nature, Perbunan; for benzol and aromatic hydrocarbons, thioplasts like Perduren or "Thiokol" are recommended. Mixes of natural and synthetic rubber combined are also used with good results.

However there are various difficulties connected with the use of synthetic rubbers for this purpose. If the compounds have not been properly prepared, there is likelihood of considerable shrinkage; thioplasts often show porous layers; while the unpleasant thermoplastic properties of the material frequently cause trouble.

Protective coatings and linings made of the polyvinyl polymerizates Oppanol and the Igelits give good results also whether used with softener added or not.

Imports and Exports

Statistics of Germany's rubber industry now also cover what was formerly Austria and the Sudeten and Memel districts. In the first five months of 1939 Germany imported 409,054 quintals of crude rubber, against 408,582 quintals in the same period of 1938. Imports of rubber manufactures in the January-May period in 1939 were 12,499 quintals, value 2,803,000 marks, and in 1938, 9,812 quintals, value 2,806,000 marks; while exports of rubber goods came to 96,034 quintals, value 21,720,000 marks, against 75,760 quintals, value 20,219,000 marks. The increase was largely due to heavier tire exports.

Exports of all kinds of tires suffered a considerable set-back in 1938 as compared with 1937, but in 1939 totals increased rapidly and regularly from month to month so that in May, 1939, they were double those of May, 1938, and even—in the case of automobile tires and tubes—above the 1937 figures. Exports of cycle tires and tubes, however, have not yet regained the 1937 level. Automobile tire exports in the first five months of 1939 were 131,726 units, against 78,286 units in 1938; automobile tubes, 100,053 against 53,274 units; cycle tires, 705,455 against 604,736 units; and cycle tubes, 875,936 against 542,350 units.

Company News

The I. G. Farbenindustrie A.G., Frankfurt a.M., reported net profits of 55,180,000 marks for 1938 and an additional 6,800,000 marks carried forward from 1936. (There were no carry-forwards at the end of 1937 or 1938.) A dividend of 8% was distributed. The company has reduced its capital from 800,000,000 to 720,000,000 marks. Domestic business further improved during the year, and continued favorable development in this direction is expected. The four-year plan demanded expansion of older lines and the large-scale production of new materials, which required the extension of existing plant and erection of or participation in new establishments. All this taxed the financial resources of the firm to the utmost and a loan of 100,000,000 marks had to be raised. Prospects for the current year are said to be good; both domestic and foreign business showed a gratifying increase during the first five months of the year as compared with last year.

Although Gummiwerk Fulda A.G., Fulda, did a gross business of 4,890,000 marks in 1938, against 2,880,000 marks in 1937, increased labor costs, larger amounts written off, and, above all, heavier taxation, led to a reduction in net profits from 134,000 to 77,000 marks.

Deutsche Dunlop reported net profits of 782,228 marks in 1938, against 871,000 the year before. To this was added the carry-forward of 760,480 marks, bringing the total to 1,542,708 marks. A dividend of 9%, against 10% in the preceding year, was declared, and 732,708 marks were carried forward.

Notes

The Dechema German Society for Chemical Plant has established a Research and Advisory Bureau for Physical-Chemical Control of factory operations and laboratory technique, to be known as F.B.B.K., under the direction of Dr. P. Wulff at whose suggestion the bureau was formed. It is aimed to disseminate information regarding modern physical and physical-chemical methods of controlling chemical processes and to make them known in scientific and technological circles.

The Deutsche Kautschuk Gesellschaft will hold its twelfth general meeting September 14-16 at Weimar, and not at Jena as originally announced.

A government order issued June 30, 1939, prohibits the manufacture and use in the entire Great Germany of various kinds of products containing cotton, including linings for hot-cured rubber footwear. The order does not apply to goods made for export.

Norwegian Latex-Kraft Co., Ltd., Oslo, capitalized at 200,000 kroner, recently was formed to manufacture a new packing material of Kraft paper and latex.

HOLLAND

The second report of the Rubber Foundation, covering the year 1938, bears impressive witness to the amount and range of the research work undertaken in the Netherlands. Experiments to improve the properties of asphalt by the addition of rubber powder were continued; new, unvulcanized powders including a new quality of Pulvatex, a nitrite crumb from Ceylon, and Mealorub, the powder developed at the West Java Experiment Station, were tested and found to have practically the same effect as powders already examined. Buna N powder was also studied; it had but little influence on the properties of asphalt bitumen mixes, which was not unexpected as Buna N swells only slightly in hydrocarbons.

Interest in asphalt-rubber compounds is apparently increasing, and numerous tests are being conducted not only for municipalities, but also for private parties. It is intended to lay a trial patch of mastic asphalt containing rubber powder in Amsterdam.

In connection with the investigations of the latex-colloidal clay system, industrial uses of the flocculate formed by adding acid to latex-colloidal clay mixtures were studied. Provisional experiments of the Netherland Government Rubber Institute in collaboration with the Government Artillery Works at Hembrug showed that a mix containing 30 vol. parts of bentonite to 100 parts of rubber meets the requirements of impermeability to liquid mustard gas when exposed to the gas for four hours; while impermeability is not impaired by disinfecting the material. These results led a Dutch factory to produce a quantity of fabric, treated with such a compound, for gas-proof suits.

Sound absorption tests indicated that a soft sponge rubber 20 mm. thick probably has a sound absorption power superior to that of all other known materials; expanded chlorinated rubber also proved to have good absorptive powers for high frequencies. For low frequencies (down to 1,000 Hz.) it has the same value as cheap absorption material, such as wood-fiber sheets.

Plastic flow or drift is being studied in connection with the vibration absorption tests. Mr. Kosten has designed an apparatus by means of which the desired compression can be produced with little energy and the drift can be observed amplified ten-fold. Tentative experiments with Perbunan mixes for vibration damping so far indicate that natural rubber is superior for the purpose.

Unique experiments are being initiated to improve the properties of plantation rubber, particularly its oil resistance, by depolymerizing the rubber and later repolymerizing it with chemical agents; a foreign chemist has been engaged for this highly complicated work.

In latex research tests were made of the effect of alternating current on creaming latex; it was found that after

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Rubber Industry in Far East

MALAYA

1938 Rubber Data

The Economics Branch of the Department of Agriculture S.S. and F.M.S. in a recent report on the Malayan rubber industry in 1938 stated that at the end of the year the total area under rubber was estimated at 3,296,647 acres. Estates of 100 acres and over accounted for 2,031,969 acres, of which 1,891,878 acres were mature. These estates also had reserve areas totaling 631,286 acres. Most of these estates, or 75.3%, are owned by Europeans; 15.9% by Chinese; 4.3% by Indians; and 4.5% by other nationalities.

At the end of 1938, there were 2,509 rubber estates recorded in Malaya, of which 856 (1,502,128 acres) were owned by public limited liability companies; the remainder, 1,653 (529,841 acres) were the property of private limited liability companies or privately owned. More than 60% of the estates, or 1,562 covering 317,889 acres, were 100 to 500 acres in extent; 362 estates (total 262,874 acres) between 500 and 1,000 acres; 532 estates of between 1,000 and 5,000 acres accounted for 1,055,083 acres, or more than half the entire estate area; finally, 53 estates of over 5,000 acres had a total area of 396,123 acres.

As the quota release decreased during 1938, the area out of tapping increased; whereas at the end of January, 1938, 10.1% of tappable rubber on estates was out of tapping (excluding rotational system resting), this increased to 28.5%, or 531,512 acres at the end of the year. In addition 329,501 acres (17.6%) were being rested under the rotational tapping system.

Budded Area

The total budded area in Malaya at the end of 1938 was 248,591 acres, against 219,925 acres in 1937. Of this, 203,040 acres consisted of budgrafts alone; the balance was mixed buddings and seedlings. The growing interest in clonal seed is reflected in the figure for the area under this type of material, which was 19,435 acres.

About two-thirds of the budded area, or 164,456 acres, had reached the tapping stage in 1938, but only 101,410 acres were actually being tapped.

Production and Exports

The total production of estates of 100 acres and over was 246,220 tons (out of a total 360,898 tons), against 314,650 tons (out of total 503,127 tons) in 1937. No separate figures are given of outputs from the budded areas.

Latex shipments from Malaya substantially decreased in 1938 compared with 1937 and were even below those of 1936. The respective figures were: 14,931 tons, 19,408 tons, and 16,937 tons. While in former years the greater part of the latex shipments consisted of the less concentrated forms of latex, in 1938, 6,747 tons out of 14,931 tons was latex with dry rubber content of over 5.7 pounds per gallon, against 4,771 tons in 1937. Latex with dry rubber content of between 4.8 and 5.7 pounds per gallon accounted for 4,554 tons, against 7,512 tons in 1937, and latex of 4.8 pounds and under, 3,630 tons.

Local Crude Rubber Consumption

Local manufacturers of rubber goods as tires, tubes, belting, footwear, etc., used 512 tons of rubber during 1938, compared with 576 tons in 1937, 435 tons in 1936, and 593 tons in 1935.

Replanting

Under rubber regulation, replanting was permitted to the extent of 10% of each owner's holding in any one year and to a total of 20% of the holding during the period June 1, 1934, to December 31, 1938. The area replanted in 1938 was 24,350 acres, and the total area replanted in the first restriction period amounted to only 81,488 acres.

Small Holdings

Small holdings, with area of less than 100 acres, had a total acreage of 1,347,914 acres, of which 1,264,678 were planted at the end of 1938. Areas out of tapping at that time were estimated to total 458,900 acres, or 36.4% of the whole. Their total production came to 114,678 tons, against 188,469 tons in 1937.

Concentrated Latex Patents

The Rubber Research Institute of Malaya in No. 4 of its new publication, the *R.R.I. Planter's Bulletin,* calls attention to the position of certain patents on concentrating latex.

The three commercially successful processes are: centrifuging, covered by the Utermark patent; creaming, covered by the Traube patent, and evaporation, protected by the Revertex Process patents. The Utermark patent expired in Great Britain and Malaya July 29, 1939; it does not seem to have been registered in the United States. The Traube patent will expire in Great Britain and Malaya on May 29, 1940, but in America not until April, 1947. Some of the patents covering the Revertex Process still have several years to run.

Even after the expiration of the main patents on the concentration processes, however, the various subsidiary patents connected with them will have to be carefully studied to avoid infringement.

Low Stocks in the S.S.

Rubber stocks in the S.S. at the end of June, 1939, were only 21,224 tons, the lowest since the introduction of the regulation scheme in June 1934. Dealers held 15,684 tons, and the remainder (5,540 tons) was in the hands of harbor boards, F.M.S. Railways, and private lighters and steamers. Total stocks at the end of May were 22,642 tons; at the end of June, 1938, they were 49,641 tons.

NETHERLAND INDIA

Goodyear Gaining

Before long the Goodyear factories at Buitenzorg will be in a position to increase their exports considerably, especially to the Far East, a Java paper learns. It seems that certain conditions have developed abroad which assure the local company of a fairly large increase in their foreign business which hitherto has been comparatively small. To meet the new requirements, expansion at the Buitenzorg works will probably be necessary.

Latex and Crude Rubber Exports

Exports of latex from Netherland India show a distinctly rising tendency, especially from Sumatra. In the three months February, March, April, 1939, shipments from this source were respectively 1,080,797 kilos, 1,024,871 kilos, and 1,237,650 kilos, or a total of 3,343,318 kilos for the three-month period. The latex shipments for all of 1938, from Sumatra, were only 6,127,906 kilos. If the present rate is continued for the rest of the current year, the total 1939 latex shipments from these parts may well equal those of 1937 when the amount was over 13,000,000 kilos.

Crude rubber exports for the first half of 1939, in metric tons, follow:

	Estate		Native	Total
	Java	Outer Provinces	Outer Provinces	Netherland India
Jan. ..	7,010	11.014	21,248	39,272
Feb. ..	4,961	8,948	11,537	25,446
Mar. ..	5,522	8.154	14,780	28,456
Apr. ..	5,466	9,093	14,295	28,854
May ..	4,218	9,049	11,600	24,867
June ..	6,165	9,349	12,688	28,202
Totals.	33,342	55,607	86,148	175,097

Specific Gravity of Rubber and Serum

In his article,[1] "Specific Gravity of Rubber and Serum Present in *Hevea* Latex," G. E. van Gils shows that the specific gravity values, as given in literature, are not reliable. In some cases the experimental method used is considered to be not beyond criticism; and in others objections arise to the interpretation of the figures obtained.

The author's method is to dilute a sample of latex to a D.R.C. of about 5% and then pass it through a milk centrifuge. The resulting cream and skim are examined for D.R.C. and specific gravity, and these figures are used to calculate the specific gravity of the rubber phase. When this is known, the specific gravity of the clear serum can be calculated from the figures of the original undiluted latex from which the sample was taken. In this way 24 samples of different origin were examined, and the variations in specific gravity of the rubber and serum of the individual samples studied. These variations in specific gravity were very small in the case of the rubber phase, but were higher for the serum. It was found that the mean specific gravity of rubber as it occurs in latex is 0.9042 and of the clear serum, 1.0237.

[1] *Arch. Rubbercultuur,* 23, 2 (1939).

SOUTH AFRICA

At present three manufacturers of tires are in the Union of South Africa: the Firestone branch at Port Elizabeth, Cape Province; Dunlop at Durbin, Natal; and a South African firm at Howich, Natal. Mechanical goods and sundries are produced by one firm in Cape Town and six in Johannesburg.

Imports of crude and manufactured rubber slumped in 1938 as compared with 1937, but showed a recovery in the first quarter of 1939. Crude rubber imports were 13,901,248 pounds in 1937, 12,428,875 pounds in 1938, and 4,201,428 pounds in the first quarter of 1939 (against 4,085,423 in the first quarter of 1938). Imports of tires and tubes were 6,321,689 pounds, value £330,050 in 1937, and 5,031,446 pounds, value £272,-844 in 1938. In the first quarter of 1939 the figures were 1,665,672 pounds, value £146,397, against 1,137,434 pounds, value £60,361 in the same period of 1938. Other rubber goods came to a value of £314,079 in 1937 and £247,108 in 1938; for the first three months of 1939 the figure was £65,656, against £65,753 in the corresponding period of the previous year.

HOLLAND

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current had been passed through latex for 20 minutes, the creaming process was about twice as fast as originally. The various stages of the Kaysam process were systematically examined, and the relative influence of different factors determined. Means to prevent the formation of film and bubbles in the manufacture of latex dipped goods were searched for, and lecithine was found the most effective preventive. Diethyl-phthalate and a commercial preparation were also very effective, but the activity of all the remedies was limited. Dialyzed latex shows less tendency to form film and bubbles than ordinary latex. Dialyzed latex was the subject of a special investigation. Latex, dialyzed four days by means of a cellophane tube against distilled water, showed practically no alkalinity; the treatment removed almost all electrolytes and the decomposition products of proteins from the serum; when acetic acid was added, coagulate formed more slowly than in the case of undialyzed latex, and the coagulate was softer and spongier. Dialyzed latex yields a very white cream. Its mechanical stability is far greater than that of undialyzed latex and is further increased by adding bentonite.

POLAND

The Stomil company, the first Polish concern to succeed in the large-scale production of pneumatic tires for automobiles, now covers 70% of the domestic demand for such tires and even exports a certain quantity. As the capacity of the firm's factory at Poznan proved insufficient, a second factory was built in Dembica where operations started in April, 1939. Synthetic rubber, also produced at the Dembica works, is now being used to a certain extent in the manufacture of tires; it is even said that some tires made exclusively of synthetic rubber have been put on the market by Stomil. This firm is also attempting to replace cotton by an artificial silk, a 100% Polish product, in the manufacture of its tires.

As local production of automobile tires increased in recent years, imports of these goods declined considerably; whereas in 1928 Poland imported tires to a value of 18,600,000 zloty, the amount in 1937 was only 4,400,000, despite increased motorization.

Polish Cable Co., Bydgoszcz, capitalized at 5,000,000 zloty, reported a profit of 1,-327,000 zloty; Leonowit Asbestos & Rubber Goods Factory, Lodz, capitalized at 350,000 zloty, reported net profits of 58,696 zloty; Piastow Rubber Works, Piastow, booked net profits of 639,883 zloty, (capital 1,200,000 zloty); and the Sanok Rubber Co. earned net profits of 432,424 zloty and paid a 10% dividend.

ITALY

Societa Italiana Pirelli closed its 1938 accounts with a profit of 43,983,081 lire and declared an 11% dividend. The general meeting approved the fusion by absorption with the S.A. per l'Industria Articoli Caoutchouc ed Antigas (Tivoli) and with the S.A. Navazza e Vianello, Milan. The Pirelli concern is capitalized at 300,000,000 lire.

Following the success of the small synthetic rubber plant at Milan, plans are being considered for a large plant. The process used by Pirelli is a modified form of the German process for Buna, based on the polymerization of butadiene, prepared from acetic aldehyde, derived from acetylene and calcium carbide and from ethyl alcohol under prescribed conditions of temperature and the presence of suitable catalysts. Besides butadiene, other secondary products as ethylene, butylene, ethyl ether, etc. are formed in the chemical reaction. The butadiene is purified through fractional distillation and is polymerized catalytically in a liquid phase; then the catalyst is eliminated through washing, and the synthetic rubber is dried, and substances are added to protect it from air oxidation. It is said that good results have been obtained which, moreover, are constant and regular. Pneumatic tires made from this material on an experimental scale are claimed to have been superior to those made from natural rubber.

NEW ENGLAND

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General Cable Corp., Pawtucket, R. I., branch, on July 29 held its annual outing at Crescent Park, attended by 400, under the sponsorship of the Sick Benefit & Recreational Club of the plant. Transportation, smokes, and refreshments were donated by the company. Field sports were held, and winners received prizes from the association. A shore dinner was served at 5 o'clock, followed by addresses by General Manager A. S. Watson and General Superintendent G. B. Buckman. A. W. Poquette is club president.

Ernest I. Kilcup, president and executive manager, Davol Rubber Co., Providence, R. I., recently was elected a member of the Corporation and Board of Fellows of the Rhode Island College of Pharmacy and Allied Sciences.

Chiksan Oil Tool Co., Ltd., of California, has changed its name to the Chiksan Tool Co. The company, formerly in Fullerton, Calif., has moved its offices into its own building in Brea, Calif., and will shortly have all its equipment for making ball bearing and swing joints and other items moved into the new plant adjacent to the office building. As a result of a recent arrangement, the company's products will in future be distributed nationally by the Crane Co., well-known manufacturer of valves. The company reports that business for July was the best ever.

Patents and Trade Marks

MACHINERY

United States

2,165,842. **Tire Tread Slitter.** E. Eger, Grosse Pointe Park, Mich., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,166,490. **Apparatus to Mold and Secure Rubber Objects to Fabric.** H. Gora, Bridgeport, Conn., assignor to Jenkins Bros., New York, N. Y.
2,166,597. **Rubber Curing Apparatus.** W. W. Knight, Evanston, assignor to Roth Rubber Co., Cicero, both in Ill.
2,167,017. **Tire Tread Slitter.** G. F. Wikle, Detroit, Mich., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,167,392. **Molded Article Forming Device.** A. McDonald, assignor to Baldwin Rubber Co., Pontiac, Mich.
2,167,692. **Golf Ball Winder.** C. R. Sibley, Marblehead, assignor to Sibley-Pym Corp., Lynn, both in Mass.
2,167,971. **Strip Material Coiling Machine.** C. C. Cadden, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,167,981. **Tire Spreader.** O. C. Kalbfleisch, Mansfield, O.
2,168,224. **Machine to Incorporate Elastic Thread or Yarn in Fabric.** R. H. Lawson, Pawtucket, and A. N. Cloutier, Lonsdale, assignors to Hemphill Co., Central Falls, all in R. I.

United Kingdom

501,066. **Rubber Cutter.** Gimson & Co. (Leicester), Ltd., W. Briers, and B. B. Chemical Co., Ltd.
501,502. **Vulcanizer.** Boston Woven Hose & Rubber Co.
501,750. **Valve Mold.** Jenkins Bros.
501,790. **Tire Valve Stem Mold.** Jenkins Bros.
501,883. **Calender.** P. Gleissner.
502,284. **Extruder.** Allmanna Svenska Elektriska Akt. and B. Hansson.
502,398. **Trimmer.** R. P. Cohen.
502,685. **Shoe Mold.** D. M. Livsey, (D. G. Gash).
502,805. **Stationary-Mold Machine.** F. Humphris.

Germany

678,042. **Device to Make Rubber Thread.** H. Ziegner, Hagen, Westf.
678,304. **Sectional Mold for Dipping.** Wilhelm Runge & Co., Koln.
678,819. **Apparatus for Extruding Bands from It-Compounds, Etc.** R. Oswald, Oñorn, Sachs.
679,115. **Device to Make Joint with Rubber Member.** Société Colaert Frères, Steenbecque, France, represented by H. Goller, H. Baumeister, and A. Boshart, all of Stuttgart.

PROCESS

United States

2,165,469. **Elastic Fabric.** M. Fellegi, assignor to West Coast-Manchester Mills, Inc., Los Angeles, Calif.
2,165,610. **Balloon.** J. F. Boyle, Teaneck, N. J.
2,165,818. **Bonding Rubber.** E. L. Scholl, Detroit, Mich., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,165,955. **Wear-Resistant Surface.** D. van der Merwe Haarhoff, Alberton, assignor to Anti-Abradants (Proprietary) Ltd., Johannesburg, both in Union of South Africa.
2,165,986. **Rubber Thread.** K. R. Shaw, assignor to Easthampton Rubber Thread Co., Easthampton, Mass.
2,166,798. **Molding Guards or Bumpers.** M. Côté, Akron, O.
2,167,215. **Sponge Rubber Roller.** J. W. Leary, Bloomfield, N. J., assignor to American Machinery & Foundry Co., a corporation of N. J.
2,167,674. **Carbon Black.** H. H. Offutt, Winchester, assignor to Godfrey L. Cabot, Inc., Boston, both in Mass.
2,167,724. **Hollow Articles.** E. A. Murphy, Birmingham, G. W. Trobridge, Sutton Coldfield, and J. A. Andrews, Birmingham, assignors to Dunlop Rubber Co., Ltd., London, England.
2,167,734. **Cutting Blanks from Plastic Strips.** F. Zonino, Naugatuck, Conn., assignor, by mesne assignments, to United States Rubber Co., New York.
2,167,869. **Golf Ball.** B. Bogoslowsky, New York, N. Y.
2,167,999. **Sponge Rubber Article.** R. E. Riley, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,168,243. **Shoes.** H. Rollmann, Koeln-Marienburg, Germany, assignor, by mesne assignments, to L. H. Grunebaum, New York, N. Y.

Dominion of Canada

382,660. **Rubber Reclaiming.** R. M. Cole, Bryn Athyn, Pa., U. S. A.
382,766. **Corrugated Rubber Bundle.** Marbon Corp., Chicago, Ill., assignee of F. E. Williams and H. F. Irving, co-inventors, both of Gary, Ind., both in the U. S. A.

United Kingdom

501,784. **Purifying Latex.** (Latex). R.P.R. Association, H. P. Stevens, and J. W. Rowe.
501,882. **Elastic Compound Fabrics.** (Latex). International Latex Processes, Ltd.
502,057. **Coating Tanks.** E. Solcia.
502,404. **Footwear.** Hungarian Rubber Goods Factory, Ltd., (Magyar Ruggyantaarugyar R. T.).
502,510. **Draught Strips.** A. C. Mirowa.
502,806. **Molding Dies.** F. Humphris.
502,857. **Truss.** G. W. Barrow.
503,034. **Metallizing Rubber Surfaces.** Soc. Anon. Des Manufactures Des Glaces Et Produits Chimiques De Saint-Gobain, Chauny, Et Cirey.

Germany

678,043. **Covering Wires with Rubber.** H. Ziegner, Hagen, Westf.
678,698. **Rubber Thread.** Kolnische Gummifaden-Fabrik vormals Ferd. Kohlstadt & Co., Koln-Deutz.
678,967. **Rubber Objects.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands, represented by C. and E. Wiegand, Berlin.

CHEMICAL

United States

2,165,589. **Vulcanized Latex Composition.** (Latex). H. B. Townsend, Belmont, assignor to Vultex Chemical Co., Cambridge, both in Mass.
2,165,623. **Rubber Preservative.** R. F. Dunbrook and B. J. Humphrey, assignors to Firestone Tire & Rubber Co., all of Akron, O.
2,165,682. **Chlorinated Rubber.** R. L. Stern, New Brunswick, N. J., assignor to Hercules Powder Co., Wilmington, Del.
2,165,951. **Plasticizer.** C. F. Winans, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.
2,165,960. **Age Resister.** A. M. Clifford, Stow, O., assignor to Wingfoot Corp., Wilmington, Del.
2,166,223. **Antioxidant.** W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,166,236. **Sound Deadener.** R. A. Crawford, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,166,324. **Vulcanized Latex - Balata Composition.** (Latex). W. E. Reichard, Elyria, and R. R. Olin, Akron.
2,166,604. **Chlorinated Rubber.** G. Meyer, Cologne-Mulheim, assignor to I. G. Farbenindustrie A.G., Frankfurt a.M., both in Germany.
2,167,030. **Vulcanizing Agent.** W. E. Messer, Cheshire, Conn., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,167,381. **Rubber Hydrohalide-Salicylic Acid Ester Compositions.** H. A. Winkelmann and E. W. Moffett, assignors to Marbon Corp., all of Chicago, Ill.
2,167,385. **Accelerator.** M. W. Harman, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.
2,167,514. **Waxy Solid Color Compositions.** (Latex). M. Jones and W. F. Smith, both of Manchester, England, and A. Stewart, Grangemouth, Scotland, assignors to Imperial Chemical Industries, Ltd.
2,168,279. **Thermoplastic Rubber Derivative.** B. S. Garvey, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

Dominion of Canada

382,411. **Rubber-like Product.** H. G. Kittredge, Dayton, O., U. S. A.
382,592. **Metal Pickling Inhibiter.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. P. ter Horst, Wayne, N. J., U. S. A.

United Kingdom

501,558. **Coating Compositions.** Atlas Powder Co.
502,108. **Textile Printing Composition.** A. Hess.

502,140. **Water-Resistant Bottle Coverings.** E. Alwardt.
502,287. **Gas-Expanded Rubber.** United States Rubber Products.
502,470. **Creaming Accelerator.** (Latex). L. Mellersh-Jackson, (United States Rubber Co.).
502,673. **Multicolored Film-Forming Composition.** M. Hess.
502,733. **Microporous Coating Compositions.** (Latex). W. Binns.
502,759. **Porous Rubber-Like Resins.** (Synthetic Rubber). Expanded Rubber Co., Ltd.
502,801. **Chlorinated Rubber Coating.** Kohle-Und Eisenforschung Ges.
502,868. **Rubber-Bitumen-Wax Cable Composition.** Telegraph Construction & Maintenance Co., Ltd., Cable & Wireless, Ltd., J. N. Dean, W. Gardner, K. L. Wood, and P. B. Alfieri.
502,877. **Chlorinated Rubber Textile Composition.** J. A. Wainwright and J. Allan.

Germany

678,798. **Increasing Stability of Chlorinated Rubber.** I. G. Farbenindustrie A.G., Frankfurt a.M.
679,587. **Emulsion Polymerization of Butadiene or Its Derivatives.** I. G. Farbenindustrie A.G., Frankfurt a.M.

GENERAL

United States

21,162. (Reissue). **Rebound Check for Golf Club Shafts.** A. E. Lard, Washington, D. C.
2,165,281. **Heel.** V. A. Lippert, assignor of one half to R. D. Wernet, both of Canton, O.
2,165,296. **Gasket Material.** A. Oass, Bremerton, Wash.
2,165,359. **Dress Shield.** LeR. Eisenberg, Flushing, assignor to I. B. Kleinert Rubber Co., New York.
2,165,375. **Shock Absorber.** W. A. Heitner, assignor to W. H. Miner, Inc., both of Chicago, Ill.
2,165,383. **Shock Absorber.** G. A. Johnson and E. H. Lehman, assignors to W. H. Miner, Inc., all of Chicago, Ill.
2,165,420. **Booth Cleaner.** C. H. Seifert, Hempstead, N. Y.
2,165,536. **Miniature Airplane Wheel.** M. L. Chappell, Los Angeles, Calif.
2,165,519. **Package Material.** H. T. Dahlgren, assignor to Teletype Corp., both of Chicago, Ill.
2,165,542. **Cable Attaching Device.** H. C. Gaither, Detroit, Mich.
2,165,601. **Leg Protector.** A. S. Woare, Devon, Mont.
2,165,608. **Spring Suspension.** J. H. Booth, Flint, assignor to General Motors Corp., Detroit, both in Mich.
2,165,679. **Mixing Cup.** P. Ringman, St. Albans, N. Y.
2,165,687. **Well Packer.** F. A. Thaheld, assignor to Guiberson Corp., both of Dallas, Tex.
2,165,702. **Resilient Mounting.** F. L. Haushalter, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,165,738. **Electric Conductor.** H. A. M. van Hoffen, Johannesburg, Transvaal, S. Africa, assignor to Naamlooze Vennootschap, Hollandsche Draad-en Kabelfabriek, Amsterdam, Netherlands.
2,165,846. **Bridge Unit.** L. Gaisman, Woodley, England.
2,165,877. **Shoe Vamp Filler.** C. A. Volz, Chicago, Ill.
2,165,879. **Ankle Support.** G. H. Wilkinson, Windsor, Ont., Canada.
2,165,920. **Pipe Joint.** H. A. Burnip, Cleveland, assignor to United States Stoneware Co., Akron, both in O.
2,165,946. **Pulverizing Machine.** C. H. Smith, Tallmadge, O., assignor to Wingfoot Corp., Wilmington, Del.
2,166,116. **Well Casing Protector.** W. I. Bettis, Los Angeles, assignor to E. B. Kleaver, Burbank, both in Calif.
2,166,224. **Tobacco Pouch.** W. H. Shaw, Mimico, Ont., Canada, assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.
2,166,290. **Steering Wheel Assembly.** H. D. Geyer, Dayton, O., assignor to General Motors Corp., Detroit, Mich.
2,166,293. **Fluid Seal.** W. A. Heinze, assignor to Victor Mfg. & Gasket Co., both of Chicago, Ill.
2,166,317. **Sole.** J. Opyt, Chicago, Ill.
2,166,376. **Coupling.** C. Saurer, assignor to Firestone Tire & Rubber Co., both of Akron, O.
2,166,384. **Tire Alarm Valve.** W. H. West, Kansas City, Mo.
2,166,420. **Cable.** E. A. Robertson, Detroit, Mich., assignor, by mesne assignments, to Bendix Aviation Corp., South Bend, Ind.
2,166,436. **Pump.** W. F. Harlow, Duffield, England.
2,166,463. **Float.** S. E. Cressey, San Pedro, Calif.
2,166,511. **Tire.** E. Witzenmann, Pforzheim, Baden, Germany.
2,166,552. **Generator.** H. Reiner, New York, N. Y.
2,166,647. **Blower.** A. G. Sutcliffe, assignor, by mesne assignments, to Ilg Electric Ventilating Co., both of Chicago, Ill.
2,166,669. **Road Marker.** F. J. Farrell, Philadelphia, assignor to Farrell Safety Road Marker, Inc., Conshohocken, both in Pa.
2,166,695. **Wheel.** A. S. Van Halteren, Lansing, Mich., assignor, by mesne assignments, to Firestone Tire & Rubber Co., Akron, O.
2,166,772. **Atomizer.** F. Salsas-Serra, Paris, France.
2,166,796. **Insulated Conductor.** C. R. Colbree, Bridgeport, Conn., assignor to General Electric Co., a corporation of N. Y.
2,166,880. **Vehicle Springing Arrangement.** H. J. Schuh, Zwichau, and W. Boxan, assignors to Auto Union A.G., both of Chemnitz, both in Germany.
2,166,927. **Tire Cooling Device.** J. Brunswick, Paris, assignor to M. and R. Baudou, both of Les Eglisottes, Gironde, both in France, and himself.
2,166,958. **Anti-slipping Device.** F. O. Lawson, Greensboro, N. C.
2,166,993. **Weatherproofing Structure.** D. H. Harnly, Chicago, Ill.; W. R. Matheny administrator of said D. H. Harnly, deceased.
2,167,035. **Sole.** M. A. Westheimer, New York, N. Y.
2,167,037. **Supporting Pad.** R. C. Benner, C. E. Wooddell, and C. S. Nelson, assignors, by mesne assignments, to Carborundum Co., all of Niagara Falls, N. Y.
2,167,129. **Brush.** W. A. Sleeper, Los Angeles, Calif.
2,167,164. **Motor Mounting Means.** A. O. Williams, assignor to Clark Equipment Co., both of Battle Creek, Mich.
2,167,178. **Cushion Support.** M. M. Kohlstadt, Spokane, Wash.
2,167,207. **Windshield Wiper.** E. C. Horton, Hamburg, assignor to Trico Products Corp., Buffalo, both in N. Y.
2,167,226. **Glove.** W. O. Wells, Evanston, Ill., and C. K. Waite, Louisiana, Mo., assignors to Wells Lamont Smith Corp., Chicago, Ill.
2,167,277. **Tire.** I. B. Kaiser, Lyons, N. Y.
2,167,296. **Blackboard Eraser.** G. C. Farmer, Richlands, Va.
2,167,384. **Belt.** A. L. Freedlander, assignor to Dayton Rubber Mfg. Co., both of Dayton, O.
2,167,398. **Tire.** I. I. Tubbs, Coral Gables, Fla.
2,167,508. **Chair Tilting Mechanism.** W. F. Herold, assignor to Bassick Co., both of Bridgeport, Conn.
2,167,568. **Tire Gage.** W. Harfst, Grand Island, Nebr.
2,167,580. **Face Protector.** R. Malcom, Chicago, Ill.
2,167,634. **Package.** W. C. Calvert, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.
2,167,669. **Sealing Structure.** L. B. Molyneux, Buffalo, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
2,167,716. **Chemically Resistant Structure.** H. H. Harkins, River Edge, N. J., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,167,782. **Deflated Tire Indicator.** C. B. Smith, Tucson, Ariz., and C. S. Harvey, Milwaukee, Oreg.
2,167,815. **Fountain Pen.** E. R. A. G. Rösler, H. W. Schwarting, and K. R. W. Kressel, assignors to Montblanc-Simplo Gesellschaft mit beschränkter Haftung, all of Hamburg, Germany.
2,167,865. **Pipe Coupling.** V. Beecher, Greenville, N. Y.
2,167,911. **Vehicle Suspension System.** G. H. Schieferstein, Berlin-Charlottenburg, Germany.
2,167,933. **Arch Support.** H. Seligmann, Munich, Germany, assignor to H. Reichmann, Chicago, Ill.
2,167,942. **Belt Unit.** A. L. Freedlander, assignor to Dayton Rubber Mfg. Co., both of Dayton, O.
2,167,965. **Heel Lift.** W. Wood, Jr., Vancouver, B. C., Canada.
2,167,972. **Protective Surface.** R. A. Crawford, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,168,008. **Apparatus to Prevent Ice Accumulation.** M. L. Taylor, Hudson, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,168,009. **Girdle.** H. Van Praag, New York, N. Y.
2,168,012. **Aircraft Surface Covering.** H. E. Waner, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,168,013. **Conveyer Belt.** R. E. Winch, Dallas, Tex., assignor to B. F. Goodrich Co., New York, N. Y.
2,168,015. **Thermal Seal.** W. C. Calvert, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.
2,168,171. **Game.** A. L. Rausher, Chicago, Ill.
2,168,202. **Windshield Wiper.** A. B. Grantham, Douglaston, N. Y.
2,168,215. **Hydraulic Transmission System.** H. J. Keitel, assignor to Dornier-Werke G. m. b. H., both of Friedrichshafen - on - the - Bodensee, Germany.
2,168,281. **Resinoid Hard Rubber Bonded Abrasive Article.** B. Sanford, assignor to Norton Co., both of Worcester, Mass.

Dominion of Canada

382,560. **Webbing.** P. H. Boivin, Granby, P. Q.
382,581. **Engine Starter.** Briggs & Stratton Corp., assignee of J. W. Fitzgerald, both of Milwaukee, Wis., U. S. A.
382,591. **Breeches.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of S. Adamson, Rye, N. Y., U. S. A.
382,630. **Tire Non-Skid Device.** J. C. Ryan, inventor, R. Bowlby, and C. B. Lewis, each an assignee of one-third of the interest, all of Toronto, Ont.
382,641. **Atomizer.** H. Holmboe, Chicago, and A. B. Cosper, Crestwood, co-inventors, both in Ill., U. S. A.
382,671. **Shoe.** T. Gutwein, Dayton, O., U. S. A.
382,690. **Overshoe.** J. J. Quaife, Maloneck, Sask., Canada.
382,714. **Container.** Baxter Laboratories, Inc., assignee of H. N. Falk, both of Glenview, Ill., U. S. A.
382,717. **Overshoe.** Cambridge Rubber, Ltd., St. Remi de Napierville, P. Q., assignee of E. W. Dunbar, Hudson, Mass., U. S. A.
382,733. **Valve Cap.** Dill Mfg. Co., Cleveland, assignee of J. C. Crowley, Cleveland Heights, both in O., U. S. A.
382,819. **Corset.** R. F. Raven, Beeston, Nottinghamshire, and H. A. Raynor, Nottingham, co-inventors, both in England.
382,827. **Tire.** E. J. Czerwin, Newark, N. J., U. S. A.
382,912. **Printing Roller.** Dayton Rubber Mfg. Co., assignee of A. L. Freedlander, both of Dayton, O., U. S. A.
382,919. **Saw.** Duro Metal Products Co., Chicago, assignee of T. L. Hedgpeth, Oak Park, co-inventors, both in Ill., U. S. A.
382,921. **Stop Nut Apparatus.** Elastic Stop Nut Corp., Elizabeth, assignee of C. A. Swanstrom, Maplewood, both in N. J., U. S. A.

United Kingdom

501,235. **Shaping Sheet Metal.** Henschel Flugzeug-Werke A. G.
501,245. **Piston.** N. F. Brown.
501,255. **Garment Shield.** W. Cichowsky.
501,289. **Valve.** J. H. McGlashen.
501,294. **Bed Pan.** G. M. N. Robertson, (M. K. N. Robertson).
501,310. **Hammer.** W. R. Stephens and Stephens Belting Co., Ltd.
501,312. **Hydraulic Master-Cylinder.** General Motors Corp.
501,332. **Guy-Ropes.** W. Hill.
501,333. **Magnetic Tests.** W. H. Tait.
501,335. **Surface-Marking Block.** G. D. Worthington and E. L. Gethin.
501,400. **Printing Brush.** T. Hilton.
501,454. **Sluice Gate.** English Electric Co., Ltd., and P. W. Seewer.
501,525. **Exerciser.** L. W. Landon.
501,557. **Ladder Rungs.** C. Robertson.
501,562. **Device to Fill Accumulators.** V. J. Beddow.
501,580. **Railway Vehicle Bogie.** L. E. W. Montrose-Oster.
501,596. **Conveyer.** H. W. McGregor.
501,618. **Chain Cycle Guard.** J. A. Crawshaw.
501,634. **Transformer.** W. H. Tait.
501,640. **Vehicle Frame.** S. Smith.
501,660. **Cable.** Siemens & Halske A.G.
501,679. **Seat Mounting.** G. H. Schieferstein.
501,744. **Shoe Scouring Tool.** British United Shoe Machinery Co., Ltd., and W. Barton.
501,746. **Device for Sanding Bricks.** E. B. Jones.
501,751. **Wearing Apparel Band.** F. A. S. Gwatkin, (Faultless Mfg. Co.).
501,758. **Friction Gearing.** A. H. Stevens, (General Tire & Rubber Co.).
501,786. **Road Surface Machine.** H. Held and J. Vogele A.G.
501,791. **Gum-Massager.** F. Berger and E. Hirschtritt.
501,795. **Shock Absorber.** Fichtel & Sachs A.G.
501,819. **Crystal Mounting.** R. W. and R. Money.
501,868. **Bed, Mattress, or Seat.** K. R. Kost.
501,879. **Aircraft.** R. L. M. F. Rouanet and F. V. A. J. Rey.
501,880. **Pacifier.** J. Lamb.
501,892. **Carrying Conductors through Partitions.** B. Berghaus.
501,910. **Saddle.** C. T. and H. Franke.
501,944. **Rubber Spring.** R. G. Rehm.
501,946. **Protective Liner for Tires.** W. H. Lambert.
501,948. **Driving Belt.** (Synthetic Rubber). A. L. Freedlander.
501,951. **Toy Blocks.** Premo Rubber Co., Ltd., and A. Levy.
501,957. **Motor.** Clipshave, Inc.
501,961. **Corset.** Berger Bros. Co.
501,971. **Clutch.** A. H. Stevens, (General Tire & Rubber Co.).
501,985. **Condenser.** A. H. Hunt, Ltd., (Solar Mfg. Corp.).
501,990. **Heel.** L. F. Small.
502,014. **Röntgen-Ray Apparatus.** W. W. Groves, (I. G. Farbenindustrie A.G.).
502,029. **Spring Suspension.** Morris Motors, Ltd., and A. A. Issigonis.
502,067. **Tube.** H. Lammermann.
502,068. **Vehicle Suspension.** Firestone Tire & Rubber Co., Ltd.
502,069. **Coupling.** F. Kornmann.
502,115. **Oil Seal.** G. Angus & Co., Ltd., (C. Freudenberg Ges.).
502,135. **Roller.** T. H. Laird.
502,150. **Lampshade Holder.** British Thomson-Houston Co., Ltd., and E. B. Tuppen.
502,167. **Therapeutic Appliance.** Elizabeth Arden, Ltd., (M. Zezi).
502,183. **Suction Box.** W. B. Dixon and Walmsleys (Bury), Ltd.
502,206. **Vaporizer.** Electrolux, Ltd.
502,208. **Hatchway Closure.** H. Scott-Paine and S. N. Barker.
502,213. **Pump.** F. O. Jaeckel.
502,272. **Safety Harness.** E. O. Robathan.
502,292. **Knitting Machine.** J. L. Getaz.
502,318. **Air Brakes.** Knorr-Bremse A.G.
502,331. **Oesophagoscope.** G. Wolf Ges.
502,338. **Brush.** A. H. Timmis and Hamilton & Co. (London), Ltd.
502,357. **Cable.** Siemens & Halske A.G.
502,386. **Pipe Joint.** M. H. Jones.
502,441. **Textile Fiber Drawing-Apparatus.** C. S. Bofill.
502,457. **Stuffing-Box Substitute.** G. Angus & Co., Ltd., (H. Freudenberg).
502,500. **Pressure Measuring Device.** W. H. Tait.

Germany

678,064. **Non-Skid Sole Studs.** W. Vorwerk, Wuppertal-Barmen.
678,392. **Syringe.** J. Fromm, Berlin-Schlachtensee.
678,460. **Caterpillar Chain.** K. Ritscher, Moorburg b. Hamburg.
678,504. **Syringe.** Cascadia Products, Ltd., London, England, represented by F. Herzfeld-Wuesthoff, Berlin.
679,315. **Joint Cover.** Universal Products Co., Inc., Dearborn, Mich., U. S. A., represented by F. Seemann and E. Vorwerk, both of Berlin.
679,384. **Rubber Bearing.** Firestone Tire & Rubber Co., Akron, O., U. S. A., represented by K. Lengner and H. Kosel, both of Berlin.
679,579. **Syringe.** J. Fromm, Berlin-Schlachtensee.

TRADE MARKS

United States

368,219. **Grizzly.** Cable. United States Rubber Products, Inc., assignor to United States Rubber Co., both of New York, N. Y.
368,305. **Vistanex.** Rubber substitute. Standard Oil Development Co., Linden, N. J.
368,349. **Performite.** Wires and cables. Okonite Co., Passaic, N. J.
368,376. **Met-Zone.** Golf balls. Rubber Specialties Co., Inc., Plymouth Meeting, Pa.
368,396. **Sta-On.** Prophylactic articles. Nutex Co., Philadelphia, Pa.
368,419. Representation of a label containing a lion and a unicorn holding representation of a crest and the letter: **"B"** and the words: **"Bercktowne of Hollywood."** Garters and suspenders. H. L. Berck, Los Angeles, Calif.
368,421. Representation of a star and the letters: **"P. C. M."** Druggists' sundries. Società Italiana Pirelli, Milan, Italy.
368,422. Representation of a star and the letters: **"P. C. M."** Balls and balloons. Società Italiana Pirelli, Milan, Italy.
368,432. **Trac-Rims.** Traction lug units for rubber tired tractor wheels. T. G. Schmeiser Co., Fresno, Calif.
368,439. Representation of a label containing the words: **"Dress Right with Bilt-Rite Girdles."** between the word: **"Bilt-Rite."** Girdles and brassieres. Bilt-Rite Foundation Co., New York, N. Y.
368,460. **Prim Mite.** Brassieres and corsets. Garfinkel & Ritter, New York, N. Y.
368,461. **Prim Rite.** Brassieres and corsets. Garfinkel & Ritter, New York, N. Y.
368,470. **Brigadier.** Storage batteries. General Tire & Rubber Co., Akron, O.
368,482. **Dura-Bond.** Hose and pipe. Hewitt Rubber Corp., Buffalo, N. Y.
368,498. **Wingfoot.** Belts, belting, and hose. Goodyear Tire & Rubber Co., Akron, O.
368,515. **Bobby 72.** Golf balls. Crown Drug Co., Kansas City, Mo.
368,571. **Nuflite.** Footwear. Woodstock Rubber Co., Ltd., Woodstock, Ont., Canada.
368,581. Representation of a rubber spider containing the words: **"Black Widow."** Rubber spider. Bean Tire & Rubber Works, San Jose, Calif.
368,585. **Plate-Tak.** Tape. Van Cleef Bros., Chicago, Ill.
368,598. **Swamp Buggy.** Tires. Firestone Tire & Rubber Co., Akron, O.
368,643. **Krotiox.** Chemicals. Titan Co. A/S, Fredrikstad, Norway.
368,644. **Rutiox.** Chemicals. Titan Co. A/S, Fredrikstad, Norway.
368,665. **Dia-trol.** Corsets, corselets, brassieres, etc. Vanity Corset Co.,

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Editor's Book Table

NEW PUBLICATIONS

"Rubber Industry of the United States, 1839—1939." P. W. Barker. Prepared under the direction of E. G. Holt, Chief of the Leather and Rubber Division, Bureau of Foreign and Domestic Commerce, Washington, D. C. 42 pages. After 100 years of progress the rubber industry of the United States is reviewed in this booklet. Brief sections are devoted to the history of rubber, early research, life of and discovery of vulcanization by Charles Goodyear, world position of the domestic industry, and principal items consumed in rubber manufacture. Plantation production and rubber manufacturing methods are briefly discussed, while the tremendous growth of the rubber industry is viewed statistically through reports of the Bureau of Census from 1849 to 1937. An alphabetical list of about 1,800 different rubber products is presented at the end of the pamphlet. This list which is believed to be the largest of its character ever published is supplemented by a summary of special uses of rubber in various fields. The booklet, priced at 10¢, may be obtained from the Superintendent of Documents, Washington, D. C.

"News about du Pont Rubber Chemicals." E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Accompanying this news letter, dated August 9, 1939, is a 28-page report, No. 39-5, entitled, "Heel and Sole Compounding —Rubber, Isolac, and Neoprene," by A. J. Northam.

"Second Report of the Rubber-Foundation Covering the Period January 1st-December 31st, 1938." Rubber-Stichting, Heerengracht 182, Amsterdam-C, Netherlands. 128 pages. In this second report a survey of the administrative, technical, and propaganda activities of the Rubber-Foundation, the Dutch organization for furthering the use of rubber, is presented. The more important activities of the Research Department during the period under review included studies on the following: asphalt-rubber powder mixes; latex-colloidal clay systems; properties of latex and latex compounds; vibration damping; bonding of rubber to other materials; and synthetic rubbers. The appendices at the end of the book cover: certain revisions in the International Rubber Regulation Agreement; balance sheet of the Rubber-Foundation; and work programs for 1939 of the Rubber-Foundation and the Experimental Station, West-Java Department, Buitenzorg.

"Proposed Revision of Federal Specification [ZZ-R-601] for Rubber Goods: General Specifications (Methods of Physical Tests and Chemical Analyses." United States Department of Commerce, National Bureau of Standards, Washington, D. C. 43 mimeographed pages. Illustrated. This suggested revision of this specification long and widely used in the industry, available free of charge by writing the National Bureau of Standards, is for comment only. Suggestions will be welcomed and given careful consideration. The actual revision will not be made until government purchasing agencies, manufacturers, and others interested have had full opportunity to express opinions and prepare recommendations.

"The Vanderbilt News." Vol. 9, No. 4. R. T. Vanderbilt Co., 230 Park Ave., New York, N. Y. 64 pages. The July-August issue, a revision of Vol. 4, No. 6, of *The Vanderbilt News,* discusses the fundamentals of rubber compounding, considering successively the results desired, the materials available, and the methods employed. Specific formulas for some of the more important applications of rubber are included as well as a short discussion of the compounding of Neoprene and "Thiokol." This issue should be definitely useful to the beginner and at the same time helpful to the experienced compounder.

"Operators Handbook." 1939 Edition. The B. F. Goodrich Co., Akron, O. 96 pages. This handbook is intended to serve as a ready reference work for users of all types of tires other than those for passenger cars. After a general discussion of tire problems the book presents specifications and data on the firm's truck, bus, tractor, industrial, and farm service tires. Other data include: load ratings and inflation pressures; tables on tires, rims, and dual spacing; load and service diagrams; load analysis; and tables on weights and measures of various commodities and materials.

"List of Publications of the Department of Commerce." United States Department of Commerce, Washington, D. C. 149 pages. This booklet, issued annually and revised up to June, 1939, contains a complete list of the available publications of the Department of Commerce and its branches. Copies may be obtained upon request from the Superintendent of Documents, Government Printing Office, Washington, D. C.

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BOOK REVIEWS

"Rubber Producing Companies—1939." Compiled by the Mincing Lane Tea & Rubber Share Broker's Association, Ltd., Plantation House, Mincing Lane, London, E.C.3, England. Published by *The Financial Times,* 72 Coleman St., London, E.C.2. Boards, 5¼ by 8 inches, 583 pages. Price 7s 6d.

This standard reference work follows the lines of previous editions. The book contains particulars of nearly 600 rubber producing companies, the data including: date of registration, list of directors and secretaries, financial structure, acreage, crops, profit and dividends, and other relevant information. Each company is described separately in alphabetical order throughout the book.

"Handbook of Chemistry and Physics." Twenty-third Edition, 1939. Chas. D. Hodgman, Editor-in-Chief. Published by Chemical Rubber Publishing Co., Cleveland, O. Fabrikoid, 4¾ by 7⅛ inches, 2239 pages. Indexed. Price $6.

The latest edition of this authoritative handbook, which comprehensively covers the three fundamental sciences—chemistry, physics, and mathematics, has been enlarged to include over 400 pages of new composition. The format has been improved by increasing the page size, thus providing larger margins. There are five general divisions of subject matter: 1. Mathematical Tables; 2. Properties and Physical Constants; 3. General Chemical Tables, and Specific Gravity and Properties of Matter; 4. Heat and Hygrometry, Sound, Electricity and Magnetism, and Light; 5. Quantities and Units, Conversion Tables, and Miscellaneous Tables. Among the new tabular data appearing in the current edition are: melting and boiling point indexes of organic chemicals, potentials of electrochemical reactions, free energy, ionization potentials, and elliptic integrals.

"Uses of Lac." H. K. Sen and S. Ranganathan. Indian Lac Research Institute, Namkum, Ranchi, India. 1939. Cloth, 4⅞ by 7⅛ inches, 79 pages. Price Re. 1/4/-.

This small book briefly discusses the uses of lac and shellac in India, principally for the following purposes: victrola records, electrical insulation, protective and decorative finishes, hat manufacture, sealing wax, and grinding wheels. A chapter on recent research developments is included.

"India Rubber Man." Ralph Wolf. Published by The Caxton Printers, Ltd., Caldwell, Idaho. 1939. Cloth, 6 by 9 inches, 291 pages. Bibliography and subject index. Price $3.

This book is more than a chronicle of historical facts; it is a story of definite human interest about a man who ranks among the foremost of American inventors. Written by the co-author of "Rubber, A Story of Glory and Greed," this is the first extensive biography of Charles Goodyear, discoverer of vulcanization and, as such, founder of the rubber industry, to appear in book form. The publication of "India Rubber Man" is timely for it was just a century ago that Goodyear made his momentous contribution to the rubber world.

Mr. Wolf has searched the literature well in providing a comprehensive historical record of Goodyear's life, but in so doing he has not sacrificed reader interest. Although the author's style tends toward the dramatic, the book is well-written and at no time is the continuity of the story lost; yet it is packed with interesting anecdotes about Goodyear and his contemporaries. Several chapters deal with the inventor's forebears, his early life, and a brief early history of rubber. The main part of the book is concerned with Goodyear's experiments with rubber, his privations, his epochal discovery, and the bitter years that followed. Legal and financial difficulties, all are treated in detail. One chapter borrows heavily from Goodyear's own book, "Gum-Elastic," in which are enumerated the many applications for rubber. Nowhere does the author lose sight of the inventor's enthusiasm which persisted even in the face of poverty, hunger, and almost unsurmountable difficulties. "India Rubber Man," a story of an unfaltering devotion to the cause of rubber, can be read with interest and profit by all and should be read by every one connected with the rubber industry.

"Dictionary of Scientific Terms." C. M. Beadnell. Chemical Publishing Co., Inc., 148 Lafayette St., New York, N. Y. 1939. Cloth, 4¾ by 7 inches, 235 pages. Price $3.

This handy reference book, which explains over 6,000 scientific terms in simple language, is based on notations taken from recently published scientific books and from articles in scientific periodicals by recognized authorities. More than a dictionary in the strictest sense, this book contains much interesting reading on a wide variety of topics not generally known—facts concerning cosmic rays, dwarf stars, hormones, vitamins, protons, electrons, etc. Numerous cross-references, synonyms, and antonyms will enable users to find quickly words of similar, related, and opposite meaning. The book should be of assistance to those who occasionally find it necessary to work in fields outside of their own specialized branch of science.

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MANUFACTURE OF AIRBAGS FOR TIRE PRODUCTION. *Gummi-Ztg.*, June 23, 1939, pp. 667-68.

SCREEN PRINTING WITH LACQUER PRINTING COLORS. H. Uebelt, *Gummi-Ztg.*, June 30, 1939, pp. 692-93.

INSULATION MATERIALS IN ELECTROTECHNICS. Dr. St. Reiner, *Gummi-Ztg.*, July 7, 1939, pp. 717-20; July 14, p. 743; July 21, p. 769; July 28, pp. 796-98. (To be continued.)

Market Reviews

CRUDE RUBBER

New York Quotations

New York outside market rubber quotations in cents per pound

	Aug. 26, 1938	July 26, 1939	Aug. 28, 1939
Plantations			
Rubber latex..*gal.*	61/62	61/62	64/65
Paras			
Upriver fine	15½	14¼	14½
Upriver fine	*18¾	*16¾	*17⅜
Upriver coarse...	11	10	10¼
Upriver coarse...	*15	*15¼	*15½
Islands fine......	15	14½	14¼
Islands fine......	*18	*17	*17
Acre, Bolivian fine	15¾	14½	14¾
Acre, Bolivian fine	*18¾	*17	*17½
Beni, Bolivian fine	16¼	15	15¼
Madeira fine	15½	14½	14½
Caucho			
Upper ball.......	11	10	10¼
Upper ball.......	*15	*15¼	*15½
Lower ball.......	10	9¾	9¾
Pontianak			
Pressed block ...	10½/20	9/16	9/15
Guayule			
Duro, washed and dried	13¼	13	13
Ampar	13¾	13¼	13¼
Africans			
Rio Nuñez	17	15⅛	16
Black Kassai ...	16½	15⅛	16
Prime Niger flake.	25	25	20
Gutta Percha			
Gutta Siak	12¼	9½	9½
Gutta Soh	15	14¾	15
Red Macassar..	1.20/1.90	90/1.20	1.20
Balata			
Block, Ciudad Bolivar	..	..	..
Manaos block ...	29	30	30
Surinam sheets...	38	42	40
Amber	40	44	43

*Washed and dried crepe. Shipments from Brazil.

Commodity Exchange

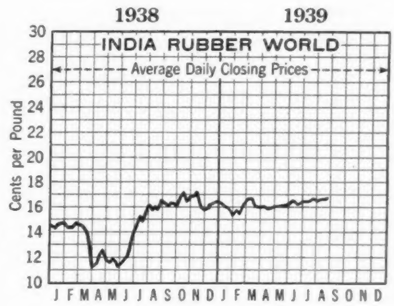
TABULATED WEEK-END CLOSING PRICES

Futures	June 24	July 29	Aug. 5	Aug. 12	Aug. 19	Aug. 26
July	16.29	.....	.....	.....	.....	.....
Aug.	.....	16.43	16.60	16.48	16.67	16.75
Sept.	16.36	16.47	16.64	16.52	16.67	16.75
Dec.	16.39	16.54	16.72	16.59	16.63	16.48
Mar.	16.45	16.57	16.73	16.64	16.64	16.41
June	.....	16.59	16.75	16.66	16.67	16.37
July	.....	.....	16.75	16.67	16.68	16.37
Volume per week (tons)...	5,450	4,600	5,890	5,400	8,990	7,860

THE Commodity Exchange table published here shows prices of representative future contracts of the New York market for the last two months.

The rubber market held generally steady last month. Closing at 16.66¢ per pound on August 1, the price of December features moved within narrow limits to close at the somewhat lower level of 16.50¢ per pound on August 23. The closing price on August 29 was 16.24¢ per pound. Trading during the past month was relatively light, with a large proportion of the transactions involving the exchange of futures for physical rubber. A steady demand from London dealers became apparent at mid-month. Toward the latter part of the month the September price was quoted at a premium over other months as a result of the tense European situation and the low supplies of available crude rubber.

Crude rubber consumption in the United States of 43,880 tons during July was 7.1% under the June figure. This decline, however, had been anticipated in view of vacation and inventory shutdowns occuring during July. With substantial activity in most lines of rubber manufacture during August it is believed that consumption for the month will total 48,000 to 50,000 tons. According to the *Statistical Bulletin of the International Rubber Regulation Committee,* world stocks outside of regulated areas further declined during June and at the end of that month totaled 375,716 tons, which amounts to only 4.4 months' supply on the basis of the previous 12 months' world absorption. This continued decline in world stocks is reflected in lower stocks in consuming countries. Total U.S. stocks on hand at the end of July amounted to 174,240 long tons, representing 3.9 months' supply on the basis of a three-month running average of consumption. Supplies of rubber in England have dropped precipitously during the



New York Outside Market—Spot Ribbed Smoked Sheets

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	July, 1939 24	25	26	27	28	29*	31
No. 1 Ribbed Smoked Sheet.	16 11/16	16 9/16	16 9/16	15½	16½	..	16⅝
No. 1 Thin Latex Crepe.....	18⅜	18¼	18¼	18 3/16	18 3/16	..	18 5/16
No. 2 Thick Latex Crepe....	19 3/16	19 1/16	19 1/16	19	19	..	19⅛
No. 1 Brown Crepe.........	16 5/16	16 3/16	16 3/16	16⅛	16⅛	..	16¼
No. 2 Brown Crepe.........	16 3/16	16 1/16	16 1/16	16	16	..	16⅛
No. 2 Amber..............	16 5/16	16 3/16	16 3/16	16⅛	16⅛	..	16¼
No. 3 Amber..............	16 3/16	16 1/16	16 1/16	16	16	..	16⅛
Rolled Brown.............	15	14⅞	14⅞	14 13/16	14 13/16	..	14 15/16

	August, 1939 1	2	3	4	5*	7	8	9	10	11	12*	14	15	16	17	18	19*
No. 1 Ribbed Smoked Sheet.	16⅝	16 9/16	16⅝	16 11/16	..	16 11/16	16 11/16	16¾	16⅝	16⅝	..	16 11/16	16⅝	16⅝	16 11/16	16 13/16	..
No. 1 Thin Latex Crepe.....	18 5/16	18	18 5/16	18⅜	..	18⅜	18⅜	18 7/16	18 5/16	18 5/16	..	18⅜	18 5/16	18 5/16	18⅜	18½	..
No. 2 Thick Latex Crepe....	19⅛	19 1/16	19⅛	19 3/16	..	19 3/16	19 3/16	19¼	19⅛	19⅛	..	19 3/16	19⅛	19⅛	19 3/16	19 5/16	..
No. 1 Brown Crepe.........	16¼	16 3/16	16¼	16 5/16	..	16 5/16	16 5/16	16⅜	16¼	16¼	..	16 5/16	16¼	16¼	16 5/16	16 7/16	..
No. 2 Brown Crepe.........	16⅛	16 1/16	16⅛	16 3/16	..	16 3/16	16 3/16	16¼	16⅛	16⅛	..	16 3/16	16⅛	16⅛	16 3/16	16 5/16	..
No. 2 Amber..............	16¼	16 3/16	16¼	16 5/16	..	16 5/16	16 5/16	16⅜	16¼	16¼	..	16 5/16	16¼	16¼	16 5/16	16 7/16	..
No. 3 Amber..............	16⅛	16 1/16	16⅛	16 3/16	..	16 3/16	16 3/16	16¼	16⅛	16⅛	..	16 3/16	16⅛	16⅛	16 3/16	16 5/16	..
Rolled Brown.............	14 15/16	14⅞	14 15/16	15	..	15	15	15 1/16	14 15/16	14 15/16	..	15	14 15/16	14 15/16	15	15⅛	..

*Closed.

New York Outside Market (Continued)

	August, 1939 21	22	23	24	25	26*
No. 1 Ribbed Smoked Sheet............	16¾	16¾	16¾	16⅞	16⅞	..
No. 1 Thin Latex Crepe................	18 7/16	18 7/16	18 7/16	18 9/16	18 9/16	..
No. 2 Thick Latex Crepe...............	19¼	19¼	19¼	19⅜	19⅜	..
No. 1 Brown Crepe.....................	16⅜	16⅜	16⅜	16½	16½	..
No. 2 Brown Crepe.....................	16¼	16¼	16¼	16⅜	16⅜	..
No. 2 Amber	16⅜	16⅜	16⅜	16½	16½	..
No. 3 Amber	16¼	16¼	16¼	16⅜	16⅜	..
Rolled Brown	14 1/16	14 1/16	15¼	15⅜	15⅜	..

*Closed.

U. S. Golf Ball Imports[1]

1939	United Kingdom No.	United Kingdom $	All Other No.	All Other $	Total No.	Total $
January	27,360	2,838	...	...	27,360	2,838
February	56,544	5,198	...	...	56,544	5,198
March	58,776	6,031	600	75	59,376	6,106
April	108,216	10,166	...	...	108,216	10,166
May (Finished) ...	26,417	4,842	24	11	26,441	4,853
(Unfinished)..	110,448	9,359	...	...	110,448	9,359
June (Finished)....	42,612	4,813	2,400	286	45,012	5,099
(Unfinished)..	3,456	424	...	...	3,456	424

[1] U. S. Dept. of Commerce, Monthly Statement No. 3752.

past year, and only 50,708 tons were on hand at the middle of August. In August, 1938, stocks stood at 99,614 tons. With a current supply of less than six months' normal peacetime requirements some anxiety is being felt, particularly in view of the tense political situation. Some British quarters hold that the government should take steps in acquiring an emergency store of rubber. During the past month Germany and other European countries have been buying heavily in the London rubber market.

It is expected that the next meeting of the I.R.R.C. will take place on September 7.

New York Outside Market

Factories were steady buyers in the outside market during August, and a fair amount of shipment business was reported as being done. The market held generally steady through the month. The price of No. 1 ribbed smoked sheets closed at 16⅝¢ per pound on August 1 and thereafter held generally steady with only minor fluctuations in price noted, closing at 16¾¢ per pound on August 29.

The week-end closing prices on No. 1 ribbed smoked sheets follow: July 29, 16½¢; August 5, 16$\frac{11}{16}$¢; August 12, 16⅝¢; August 19, 16$\frac{13}{16}$¢; and August 26, 16⅞¢.

TRADE MARKS

(Continued from page 62)

Inc., New York, N. Y.

368,679. **"Magic Darts."** Corsets and foundation garments. International Corset Co., Aurora, Ill.

368,706. **Slacklette.** Brassiere, girdle, and pantie combination garment. La Vel Co., Los Angeles, Calif.

368,732. **Singletex.** Rubber thread. United Elastic Corp., Easthampton, Mass.

368,734. Circle containing representation of a ship and the word: **"Viking."** Rubber yarn. Quaker Worsted Mills Corp., Philadelphia, Pa.

368,735. **I-P.** Tension, compression, and fatigue testers. Henry L. Scott Co., Providence, R. I.

368,812. **Ink-Vue.** Fountain pens. H. Sachnoff, New York, N. Y.

368,845. Representation of a label containing the word: **"Rub-Whisk"** and a star on each side of the label. Rubber brushes. J. Weil, New York, N. Y.

368,848. **Cap-Weld "Vapor" Cure Process.** Vapor cure vulcanizing steam chamber and tire building machine. J. Milhander, Los Angeles, Calif.

368,880. Representation of a label containing the word: **"Glenette."** Sanitary belts. Beltx Corp., St. Louis, Mo.

368,888. **"Le Bu Lex."** Rubber sanitary napkin covers. H. S. Mayer, New York, N. Y.

368,899. **Rxfilm.** Transparent sheet material. Ivers-Lee Co., Newark, N. J.

368,946. **Killian.** Prophylactic goods. Killian Mfg. Co., Akron, O.

368,951. Label containing representation of a shield and the letters: **"G C"** and the words: **"Custom Craft," "Heavy Duty Tube."** Inner tubes. Norwalk Tire & Rubber Co., Norwalk, Conn.

369,168. **Guai-A-Phene.** Antioxidant. Glidden Co., doing business as Southern Pine Chemical Co., Cleveland, O.

IMPORTS, CONSUMPTION, AND STOCKS

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks

Twelve Months	U. S. Imports* Tons	U. S. Consumption¶ Tons	U. S. Stocks Mfgrs., Importers, Dealers, Etc.† Tons	U. S. Stocks Afloat† Tons	U. K.— Public Warehouses, London Liverpool†‡ Tons	Singapore and Penang Dealers and Port Stocks†‡ Tons	World Production (Net Exports)‡ Tons	World Consumption Estimated‡ Tons	World Stocks†‡§ Tons
1937	584,851	543,600	262,204	63,099	57,785	44,792	1,139,800	1,104,991	a639,021
1938	400,178	437,031	231,500	45,105	86,853	27,084	894,944	941,355	586,776
1938									
Jan.	42,135	31,265	276,497	57,356	62,108	48,494	80,339	70,141	636,246
Feb.	43,930	25,357	292,067	47,459	71,516	46,241	81,179	63,951	651,520
Mar.	35,967	32,389	301,762	41,882	76,617	50,797	82,024	80,467	672.922
Apr.	30,807	29,730	303,901	39,071	82,754	40,614	87,234	71,613	670,905
May	27,410	30,753	300,907	32,859	87,215	40.598	65,151	78,418	654,516
June	26,011	32,540	294,796	32,079	92,312	44,729	71,195	72,310	670.298
July	22,918	34,219	282,785	40,400	95,252	45,529	80,209	74,305	668,744
Aug.	31,099	40,552	273,841	47,772	99,614	41,002	75,213	75,780	651,082
Sept.	37,374	40,183	268,094	48,927	98,140	35,386	71,211	80,143	637,886
Oct.	34,496	42,850	259,074	51,062	93,272	34,901	75,869	88,617	623,717
Nov.	31,054	49,050	242,592	51,114	90,073	31,255	67,370	94,672	592,545
Dec.	36,977	48,143	231,500	45,105	86,853	27,084	57,950	90,938	586,776
1939									
Jan.	39,082	46,234	223,879	48,210	80,643	30,975	87,497	88,941	584,429
Feb.	36,490	42,365	217,534	55,814	75,517	28,559	77,646	83,700	568,780
Mar.	38.989	50.165	205.936	55.981	72,235	23,255	77,039	94,970	545,459
Apr.	29,601	44,166	190,896	57,918	68,931	22,434	73,865	86,703	518,651
May	47,535	44,377	193,602	54,046	66,020	20,849	70,490	89,300	512,384
June	35,947	47,259	181,794	51,274	63,878	19,585	65,147	88,827	......
July	36,739	43,880	174,240	52,990	......	......	......	......	......

*Including liquid latex. †Stocks on hand the last of the month or year. ‡Statistical Bulletin of the International Rubber Regulation Committee. §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos, regulated areas, and afloat. ¶Corrected to 100% from estimate of reported coverage. *a* Include stocks from Japan.

CRUDE rubber consumption by United States manufacturers during July is estimated at 43,880 long tons, against 47,259 long tons during June, a 7.1% decrease, but 28.2% more than the 34,219 (revised) long tons consumed in July, 1938, according to the R.M.A.

July gross imports of crude rubber are reported to be 36,739 long tons, 2.2% more than the June figure of 35,947 long tons and 60.3% over the 22,918 long tons imported in July, 1938.

Total domestic stocks of crude rubber on hand July 31 are estimated at 174,240 long tons, compared with June 30 stocks of 181,794 long tons and 282,785 (revised) long tons on hand July 31, 1938.

Crude rubber afloat to U. S. ports as of July 31 is figured to be 52,990 long tons, against 51,274 long tons afloat on June 30 and 40,400 long tons afloat on July 31, 1938.

London and Liverpool Stocks

Week Ended	London (Tons)	Liverpool (Tons)
July 29	37,930	18,903
August 5	36,843	18,281
August 12	36,141	18,117
August 19	33,137	17,571
August 26	29,108	16,513

LEGAL

Disclaimers

1,662,035. *Frank L. Smith, Jacob S. Caufield,* and *Charles J. Peterson,* Sacramento, Calif. Retread Mold for Tires. Patent dated March 6, 1928. Disclaimer filed May 18, 1939, by the assignee, *Super Mold Corp. of California.* Hereby enters this disclaimer to claim 12.

1,784,523. *Ernest Hopkinson,* New York, N. Y. Method of Rubberizing Fibrous Material and Article Produced Thereby. Patent dated December 9, 1930. Disclaimer filed May 20, 1939, by the assignee, *United States Rubber Co.* Hereby enters this disclaimer to each of claims 1, 2, 3, 4, 5, 6, 7, 12, and 13 of said Letters Patent.

1,816,574. *Boutwell H. Foster,* Maplewood, N. J., and *Kenneth B. Cook,* Winnsboro, S. C. Pile or Tufted Sheet Fibrous Material. Patent dated July 28, 1931. Disclaimer filed May 20, 1939, by the assignee, *United States Rubber Co.* Hereby enters this disclaimer to each of claims 1, 2, 3, 5, 6, 7, 8, 10, and 11 of said Letters Patent.

Patent Suits

1,605,445, F. L. Killian, Machine for manufacturing thin rubber articles, filed January 11, 1939, D. C. N. J., Doc. 144, *F. B. Killian et al* v. *Standard Latex Products Corp.*

1,915,041, A. L. Wallace, Hose coupling, D. C. N. J., Doc. E 5732, *Metal Hose & Tubing Co., Inc.* v. *Baxter Rubber Co.* Dismissed January 20, 1939.

COMPOUNDING INGREDIENTS

THE compounding materials market, contrary to the usual seasonal trend, continued active during August. The outlook for the fall is favorable, although a slight recession from the current high rate of activity may take place. Uncertainty as to the European political situation is a disturbing element regarding the near future. Prices in general hold steady and unchanged.

CARBON BLACK. Heavy buying of carbon black by tire manufacturers continued through the first week of August and then tapered off somewhat with stocks in the hands of consumers apparently large enough to supply part of their immediate needs. The price remains unchanged.

According to the Texas Railroad Commission, production of carbon black in Texas during the first half of 1939 totaled 7,078,099 pounds, against 6,792,068 pounds during the like period last year.

FACTICE OR RUBBER SUBSTITUTE. The demand continues to hold at a high level, with indications of sustained activity during the fall. Prices are substantially unchanged.

LITHARGE. Shipments into consumption during August were at a satisfactory rate. Commercial material in barrels was advanced ¼¢ per pound. The new prices are: 20 tons or more, delivered, 6.60¢ to 6.85¢ per pound; five tons to 20 tons, 7¢ to 7¼¢ per pound; and smaller lots, 7½¢ to 7¾¢ per pound. Prices of material sold in smaller containers than barrels were not affected.

RUBBER CHEMICALS. The demand for accelerators and antioxidants during the past month continued high as during July. Prices remain substantially unchanged.

RUBBER SOLVENTS. Demand for rubber solvents was very good in early August, but shipments decreased somewhat during the middle of the month. Prices held steady at levels in force during the past six months, and, despite the recent reduction in the price of crude oil, it is expected that prices will continue on the same basis during the rest of the year.

TITANIUM PIGMENTS. August demand slackened to a degree consistent with the normal let-down of the summer, but consumption continued at the same relative advance over 1938 as existed in previous months. Prices hold steady at the schedules made effective on June 28.

ZINC OXIDE. The demand last month was very good, and prices, which continue firm and unchanged, are expected to hold through the fourth quarter.

New York Quotations

August 24, 1939

Prices Not Reported Will Be Supplied on Application

Abrasives			
Pumicestone, powdered	lb.	$0.03	/$0.035
Rottenstone, domestic	lb.	.03	/ .035
Silica, 15	ton	38.00	
Accelerators, Inorganic			
Lime, hydrated, l.c.l., New York	ton	20.00	
Litharge (commercial)	lb.	.0675	/ .0725
Accelerators, Organic			
A-1	lb.	.24	/ .30
A-10	lb.	.31	/ .35
A-11	lb.	.52	/ .65
A-19	lb.	.52	/ .65
A-32	lb.	.70	/ .80
A-77	lb.	.42	/ .55
A-100	lb.	.42	/ .55
Accelerator 49	lb.	.40	/ .42
737	lb.	.42	/ .43
737-50	lb.	.25	/ .26
808	lb.	.70	/ .72
833	lb.	1.15	
Acrin	lb.	.60	
Aldehyde ammonia	lb.	.70	
Altax	lb.	.55	/ .70
B-J-F	lb.	.50	/ .55
Beutene	lb.	.70	/ .75
Butyl Zimate	lb.	2.50	
C-P-B	lb.	2.00	
Captax	lb.	.50	/ .60
Crylene	lb.	.40	/ .47
Paste	lb.	.30	/ .36
D-B-A	lb.	2.00	
Delac A	lb.	.40	/ .50
O	lb.	.40	/ .50
P	lb.	.40	/ .50
Di-Esterex	lb.	.60	/ .70
N	lb.	.60	/ .70
DOTG (Di-ortho-tolylguanidine)	lb.	.44	/ .46
DPG (Diphenylguanidine)	lb.	.35	/ .36
El-Sixty	lb.	.50	/ .65
Ethylideneaniline	lb.	.42	/ .43
Ethyl Zimate	lb.	2.50	
Formaldehyde P.A.C.	lb.	.0625	
Formaldehydeaniline	lb.	.31	
Formaldehyde-para-toluidine	lb.	.52	/ .54
Guantal	lb.	.40	/ .50
Hepteen	lb.	.35	/ .40
Base	lb.	1.35	/ 1.50
Hexamethylenetetramine			
U.S.P.	lb.	.39	
Technical	lb.	.33	
Lead oleate, No. 999	lb.	.135	
Witco	lb.	.15	
Monex	lb.	2.35	
Novex	lb.		
O. N. V.	lb.	1.00	/ 1.10
O-X-A-F	lb.	.50	/ .55
Ovac	lb.	.50	/ .55
Para-nitroso-dimethylaniline	lb.	.85	
Pentex	lb.	$1.00	/$1.10
Flour	lb.	.15	/ .16
Pip-Pip	lb.	2.50	
Pipsolene	lb.	1.55	/ 1.85
R-2	lb.	1.40	/ 1.80
R-23	lb.	.40	
R & H 50-D	lb.	.42	/ .43
Rotax	lb.	.60	/ .65
Safex	lb.	1.20	/ 1.30
Santocure	lb.	.80	/ 1.00
Super-sulphur No. 1	lb.	.50	
2	lb.	.18	/ .25
Tetrone A	lb.	2.70	
Thiocarbanilide	lb.	.24	
Thionex	lb.	2.35	
Trimene	lb.	.55	/ .65
Base	lb.	1.05	/ 1.20
Triphenylguanidine (TPG)	lb.	.45	
Tuads	lb.	2.35	
Ureka	lb.	.60	/ .75
Blend B	lb.	.60	/ .75
C	lb.	.56	/ .65
Vulcanex	lb.	.42	/ .43
Vulcanol	lb.	.85	
Z-B-X	lb.	2.50	
Zenite	lb.	.46	/ .48
A	lb.	.53	/ .55
B	lb.	.46	/ .48
Zimate	lb.	2.35	
Activator			
Aero Ac 50	lb.	.46	/ .52
Barak	lb.	.50	
Age Resisters			
AgeRite Alba	lb.	1.50	/ 2.00
Exel	lb.	1.00	/ 1.40
Gel	lb.	.57	/ .75
Hipar	lb.	.65	/ .92
Powder	lb.	.52	/ .65
Resin	lb.	.52	/ .65
D	lb.	.52	/ .65
White	lb.	1.25	/ 1.65
Akroflex C	lb.	.56	/ .58
Albasan	lb.	.70	/ .75
Aminox	lb.	.52	/ .61
Antox	lb.	.56	
B-L-E	lb.	.52	/ .61
Powder	lb.	.65	/ .74
B-X-A	lb.	.55	/ .61
Copper Inhibitor X-872-A	lb.	1.15	
Flectol B.	lb.	.52	/ .65
H	lb.	.52	/ .65
White	lb.	.90	/ 1.15
M-U-F	lb.	1.50	
Neozone (standard)	lb.	.63	
A	lb.	.52	/ .54
B	lb.	.63	
C	lb.	.52	/ .54
D	lb.	.52	/ .54
E	lb.	.63	
Oxynone	lb.	.64	/ .80
Parazone	lb.	$0.68	
Permalux	lb.	1.20	
Santoflex B	lb.	.52	/$0.65
Solux	lb.	1.30	
Thermoflex A	lb.	.65	/ .67
V-G-B	lb.	.52	/ .61
Alkalies			
Caustic soda, flake, Columbia (400 lb. drums)	100 lbs.	2.70	/ 3.55
liquid, 50%	100 lbs.	1.95	
solid (700 lb. drums)	100 lbs.	2.30	/ 3.15
Antiscorch Materials			
A-F-B	lb.	.35	/ .40
Antiscorch T	lb.	.90	
E-S-E-N	lb.	.35	/ .40
R-17 Resin (drums)	lb.	.10	
RM	lb.	1.25	
Retarder W	lb.	.36	
U.T.B.	lb.	.35	/ .40
Antisun Materials			
Heliozone	lb.	.21	
Sunproof	lb.	.20	/ .25
Colors			
BLACK			
Du Pont powder	lb.	.42	/ .44
Lampblack (commercial)	lb.	.15	
BLUE			
Brilliant	lb.		
Du Pont dispersed	lb.	.83	/ 3.60
Powders	lb.	2.25	/ 3.75
Prussian	lb.	.0375	
Toners	lb.	.08	/ 3.85
BROWN			
Mapico	lb.	.11	
GREEN			
Brilliant	lb.		
Chrome, light	lb.		
medium	lb.	.22	
oxide (freight allowed)	lb.		
Dark	lb.		
Du Pont dispersed	lb.	.98	/ 1.75
Powders	lb.	1.00	/ 2.00
Guignet's, Easton, Pa., bbls.	lb.	.70	
Light	lb.		
Toners	lb.	.85	/ 3.75
ORANGE			
Du Pont dispersed	lb.	.88	/ .90
Powders	lb.	.80	/ 2.50
Lake	lb.		
Toners	lb.	.40	/ 1.60
ORCHID			
Toners	lb.	1.50	/ 2.00
PINK			
Toners	lb.	1.50	/ 2.00
PURPLE			
Permanent	lb.		
Toners	lb.	.60	/ 2.10

RED
Antimony
Crimson, 15/17% ....lb. $0.45
R. M. P. No. 3........lb. .48
Sulphur free ....lb. .50
R.M.P. ....lb. .52
Golden 15/17% ....lb. .28
7-A ....lb. .37
Z-2 ....lb. .23
Aristi ....lb. 1.75
Cadmium, light (400 lb. bbls.) ....lb. .70 /$0.75
Chinese ....lb.
Crimson ....lb.
Du Pont dispersed ......lb. .93 / 2.05
Powders ....lb. .52 / 1.05
Mapico ....lb. .0925
Medium ....lb.
Rub-Er-Red, Easton, Pa., bbls. ....lb. .0925
Scarlet ....lb.
Toners ....lb. .08 / 2.00

WHITE
Lithopone (bags) ....lb. .0375/ .04
Albalith Black Label-11..lb. .0375/ .04
Astrolith ....lb. .0375/ .04
Azolith ....lb. .0375/ .04
Cryptone-BA-19 ....lb. .0525/ .055
BT ....lb. .0525/ .055
CB ....lb. .0525/ .055
ZS No. 20..............lb. .075 / .0775
86 ....lb. .07⅝/ .08⅛
230 ....lb. .07⅞/ .08⅛
Sunolith ....lb. .0375/ .04
Ray-Bar ....lb. .0525/ .0625
Ray-Cal ....lb. .0525/ .0625
Rayox ....lb. .13 / .16
Titanolith (5-ton lots).....lb. .0525/ .055
Titanox-A (50-lb. bags)....lb. .13 / .1375
B (50-lb. bags) ....lb. .0525/ .055
30 (50-lb. bags) ......lb. .0525/ .055
C (50-lb. bags)..........lb. .0525/ .055
M (50-lb. bags)..........lb. .0525/ .055
Ti-Tone ....lb.
Zinc Oxide
Azo ZZZ-11 ....lb. .0625/ .065
44 ....lb. .0625/ .065
55 ....lb. .0625/ .065
66 ....lb. .0625/ .065
French Process, Florence
White Seal-7 (bbls.)...lb. .085 / .0875
Green Seal-8 ....lb. .08 / .0825
Red Seal-9 ....lb. .075 / .0775
Kadox, Black Label-15....lb. .065 / .0675
No. 25 ....lb. .075 / .0775
Red Label-17 ....lb. .065 / .0675
Horse Head Special 3...lb. .0625/ .065
XX Red-4 ....lb. .0625/ .065
23 ....lb. .0625/ .065
72 ....lb. .0625/ .065
78 ....lb. .0625/ .065
80 ....lb. .0625/ .065
103 ....lb. .0625/ .065
110 ....lb. .0625/ .065
St. Joe (lead free)
Black Label ....lb. .0625/ .065
Green Label ....lb. .0625/ .065
Red Label ....lb. .0625/ .065
U.S.P. ....lb. .095 / .0975
White Jack ....lb. .075 / .0775
Zopaque ....lb. .13 / .1475

YELLOW
Cadmolith (cadmium yellow), 400 lb. bbls. ....lb. .45 / .50
Du Pont dispersed.........lb. 1.25 / 1.75
Powders ....lb. 1.55 / 1.37
Lemon ....lb.
Mapico ....lb. .0675
Toners ....lb. 2.50

Dispersing Agents
Darvan ....lb. .30 / .47
Nevoll (drums) ....lb. .0215
Santomerse S ....lb. .11 / .25

Fillers, Inert
Asbestine, c.l., f.o.b., mills.ton 15.00
Barytes ....ton 30.00 /36.00
f.o.b., St. Louis (50 lb. paper bags).......ton 22.85
off color, domestic......ton 20.00 /25.00
white, imported ....ton 29.00 /32.00
Blanc fixe, dry, precip.....lb. .03 / .035
Calcene ....ton 37.50 /43.00
Infusorial earth ....lb. .02 / .03
Kalite No. 1...............ton 24.00 /50.00
3 ....ton 34.00 /60.00
Magnesia, calcined, heavy..lb. .04
Carbonate, i.c.l. ....lb. .07 / .095
Pyrax A ....ton 6.50 /20.00
Whiting
Columbia Filler ....ton 9.00 /14.00
Guilders ....100 lbs.
Hakuenka ....lb.
Paris white, English cliffstone ....100 lbs.
Southwark Brand, Commercial ....100 lbs.
All other grades...100 lbs.
Suprex, white extra light.ton 45.00 /60.00
heavy ....ton 45.00 / 60.00
Witco, c.l. ....ton 6.00

Finishes
Rubber lacquer, clear.....gal.
colored ....gal.

Starch, corn, pwd.....100 lbs.
potato ....lb.
Talc ....ton $25.00 /$45.00

Flock
Cotton flock, dark.........lb. .105 / .13
dyed ....lb. .45 / .85
white ....lb. .12 / .18
Rayon flock, colored.......lb. 1.10 / 1.50
white ....lb. .90

Latex Compounding Ingredients
Accelerator 85 ....lb. .35
89 ....lb. 1.40
122 ....lb. 1.55
552 ....lb. 2.50
Aerosol OT Aqueous 10%..lb. .15
Antox, dispersed ....lb. .42
Aquarex A ....lb. .35
D ....lb. .75
F ....lb. .85
WA Paste ....lb. .25
Areskap No. 50 ....lb. .18 / .24
100, dry ....lb. .39 / .51
Aresket No. 240............lb. .16 / .22
300, dry ....lb. .42 / .50
Aresklene No. 375..........lb. .35 / .50
400, dry.................lb. .51 / .65
Black No. 25, dispersed...lb. .22 / .40
Catalpo ....ton
Collocarb ....lb. .055 / .07
Color Pastes, dispersed....lb. .35 / 1.90
Dispersex No. 15...........lb. .11 / .12
No. 20 ....lb. .08 / .10
Emo, brown ....lb. .15
white ....lb. .15
Factice Compound, dispersed ....lb. .36
Heliozone, dispersed ......lb. .25
Igepon A ....lb.
MICRONEX, Colloidal ....lb. .055 / .07
Nekal BX (dry).............lb.
Palmol ....lb. .10
Pipsol X ....lb. 3.05 / 3.55
R-2 Crystals ....lb. 2.50 / 2.75
R-23 ....lb. .40
R-N-2 ....lb. 1.40 / 1.80
Crystals ....lb. 2.00 / 2.25
S.1 (400 lb. drums)........lb. .65
Santomerse D ....lb. .41 / .65
S ....lb. .11 / .25
No. 1..................lb. .18 / .35
No. 2..................lb. .18 / .35
No. 3..................lb. .40 / .65
No. 3P ....lb. .29 / .45
Santovar A ....lb. 1.15 / 1.40
Stablex A ....lb. .90 / 1.10
B ....lb. .65 / .90
C ....lb. .40 / .50
Sulphur, dispersed ....lb. .10 / .15
No. 2 ....lb. .075 / .15
T.1. (400 lb. drums).......lb. .40
Tepidone ....lb. 1.45
Vulcan Colors ....lb.
Zinc oxide, dispersed......lb. .12 / .15

Mineral Rubber
Black Diamond ....ton 25.00
Hydrocarbon, hard ....ton 22.00 /42.00
Parmr ....ton 22.00 /24.00
Pioneer ....ton
285°-300° ....ton 22.00 /42.00

Mold Lubricants
Mold Paste ....lb. .12 / .18
Sericite ....ton 65.00 /75.00
Soapbark ....lb.
Soapstone ....ton 25.00 /35.00

Oil Resistant
AXF ....lb. .40 / .50

Reenforcers
Carbon Black
Aerfloted Arrow Specification Black ....lb. .0275/ .0625
Arrow Compact Granulized Carbon Black ....lb. .0275/ .0625
"Certified" Heavy Compressed, Cabot ....lb.
Spheron ....lb.
Carbitum ....ton 58.00/ 63.00
Continental Dustless, c.l..lb. .0275
Compressed, c.l. ....lb. .0275
Uncompressed, c.l. .....lb. .0275
Disperso, c.l. ....lb. .0275/ .0375
Dixie, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. ...lb. .0275
c.l., delivered New York.lb. .0375
local stock, bags, delivered ....lb. .0625
Dixiedensed, c.l., f.o.b., New Orleans, La., Galveston or Houston, Tex.....lb. .0275
c.l., delivered New York.lb. .0375
local stock, bags, delivered ....lb. .0625
Dixiedensed, 66, c.l., f.o.b., New Orleans, La., Galveston or Houston, Tex. ....lb. .0275
c.l., delivered New York.lb. .0375
local stock, bags, delivered ....lb. .0625

Excello, c.l., f.o.b. Gulf ports ....100 lbs. $2.75 /$4.75
delivered New York.100 lbs. 3.75 / 5.75
l.c.l., delivered New York ....100 lbs. 6.25 / 7.00
Fumonex, c.l., f.o.b. works.lb. .03
ex-warehouse ....lb. .05
Gastex ....lb. .03 / .07
Kosmobile, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.....lb. .0275
c.l., delivered New York.lb. .0375
local stock, bags, delivered ....lb. .0625
Kosmobile 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. ....lb. .0275
c.l., delivered New York.lb. .0375
local stock, bags, delivered ....lb. .0625
Kosmos, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.....lb. .0275
c.l., delivered New York.lb. .0375
local stock, bags, delivered ....lb. .0625
MICRONEX Beads, c.l., f.o.b. Gulf ports...lb. .0275
c.l., delivered, New York ....lb. .0375
local stock, bags, delivered ....lb. .0625
Mark II, c.l., f.o.b. Gulf ports ....lb. .0275
c.l., delivered, New York ....lb. .0375
local stock, bags, delivered ....lb. .0625
Standard, c.l., f.o.b. Gulf ports ....lb. .0275
c.l., delivered, New York ....lb. .0375
local stock, bags, delivered ....lb. .0625
W-5, c.l., f.o.b., Gulf ports ....lb. .0275
c.l., delivered, New York ....lb. .0375
local stock, bags, delivered ....lb. .0625
W-6, c.l., f.o.b., Gulf ports ....lb. .0275
c.l., delivered, New York ....lb. .0375
local stock, bags, delivered ....lb. .0625
Paradene No. 2 (drums).lb. .04
Pelletex ....lb. .03 / .07
Supreme, c.l., f.o.b. Gulf ports ....100 lbs. 2.75 / 4.75
delivered New York.100 lbs. 3.75 / 5.75
l.c.l., delivered New York ....100 lbs. 6.25 / 7.00
"WYEX BLACK"......lb. .0275/ .0625
Clays
Aerfloted Paragon (50 lb. bags) ....ton 9.50 /22.00
Suprex (50 lb. bags)..ton 9.50 /22.00
Barden ....lb.
Chicora ....lb.
China ....ton 17.50 /20.00
Crown, f.o.b. (plant)...ton 9.50
Dixie ....ton 11.00 /26.00
Junior ....ton 9.50 /24.00
Hi-White, f.o.b. Huber Ga. ....ton 9.50
McNamee ....ton 9.50 /22.00
Par ....ton 9.50 /22.00
Witco, f.o.b. works....ton 9.50
P-33 ....lb. .0475/ .0775
Thermax ....lb. .0175/ .05
Velvetex ....lb. .022 / .035

Reodorants
Amora A ....lb.
B ....lb.
C ....lb.
D ....lb.
Curodex 19 ....lb. 2.75
188 ....lb. 3.50
198 ....lb. 4.50
Rodo No. 0.................lb. 3.50 / 4.00
10 ....lb. 4.50 / 5.00

Rubber Substitutes
Black ....lb. .07 / .11
Brown ....lb. .07 / .095
White ....lb. .0775/ .11
Factice
Amberex ....lb. .17
Brown ....lb. .07 / .095
Fac-Cel B ....lb. .12
C ....lb. .12
Neophax A ....lb. .0925
B ....lb. .0925
White ....lb. .08 / .115

Softeners
Bondogen ....lb. .98 / 1.50
Burgundy pitch ....lb. .06
Cycline oil ....gal. .14 / .20
Nuba resinous pitch (drums) Grades No. 1 and No. 2..lb. .0265
Nubalene Resin ....lb. .025

(Continued on page 76)

COTTON AND FABRICS

New York Cotton Exchange Week-End Closing Prices

Futures	June 24	July 29	Aug. 5	Aug. 12	Aug. 19	Aug. 26
July	9.46	....	....	....	....	....
Aug.	....	8.97	8.91	8.81	....	....
Sept.	8.87	9.00	9.00	8.83	8.77	8.64
Dec.	8.55	8.81	8.77	8.61	8.57	8.43
Mar.	8.35	8.56	8.54	8.37	8.38	8.23
June	....	8.36	8.31	8.11	8.15	8.01
July	....	8.31	8.22	8.01	8.07	7.93

THE accompanying table of week-end closing prices on the New York Cotton Exchange shows the week-end change of representative futures covering the past two months.

The cotton market was generally easy during August, with cotton prices showing a gradual, but steady decline. After closing at 9.81¢ per pound on August 1, the New York spot middling price receded to close at 9.19¢ per pound on August 21, the low for this movement. On the following day, August 22, the price rose to 9.27¢ per pound. The closing price on August 29 was 8.91¢ per pound.

The Census Bureau reported July cotton consumption in the United States at 521,405 bales, against 578,448 in June and 448,453 in July, 1938. Consumption for the crop year ended July 31 totaled 6,860,247 bales, against 5,747,978 for the previous like period. Cotton carry-over at the beginning of the cotton year of 1939-40, on August 1, was 13,032,611 running bales, the largest quantity of cotton held at this time of the year in the history of government statistics. Cotton exports during the "cotton year" ended on July 31 dropped to the lowest volume in 60 years, 3,327,000 bales, 40.6% below the previous year.

Production of 11,412,000 bales of cotton during the current crop year, the smallest since 1935, was estimated by the Crop Reporting Board, Department of Agriculture, on the basis of August 1 conditons.

On August 15 the New York Cotton Exchange put into effect a new cotton contract, based on the delivery of 15/16-inch staple. Trading will be done simultaneously on the old and new contracts until the expiration date of the most distant delivery month on the board.

Fabrics

Cotton textiles of coarse yarn construction continued in good demand during early August. Toward the latter part of the month business fell off under the influence of political developments abroad, with trading limited to orders for immediate delivery. It is generally anticipated that activity will be resumed after Labor Day.

Prices in general remain substantially unchanged with only a few types of construction showing small price variations over the quotations given for last month.

New York Quotations

August 25, 1939

Drills		
38-inch 2.00-yard .... *yd.*		$0.11
40-inch 3.47-yard		.07
50-inch 1.52-yard		.15½
52-inch 1.85-yard		.13
52-inch 1.90-yard		.11¾
52-inch 2.20-yard		.11
52-inch 2.50-yard		.09¾
59-inch 1.85-yard	.12	/.12½
Ducks		
38-inch 2.00-yard D.F. .... *yd.*	.11	/.11½
40-inch 1.45-yard S. F.		.15⅞
51½-inch 1.35-yard D. F.		.16¼
72-inch 1.05-yard D. F.	.22	/.22⅞
72-inch 17.21-ounce		.25¾
Mechanicals		
Hose and belting .... *lb.*		.25
Tennis		
52-inch 1.35-yard .... *yd.*		.17¾
Hollands		
Gold Seal and Eagle		
20-inch No. 72 .... *yd.*		.09
30-inch No. 72		.16
40-inch No. 72		.18
Red Seal and Cardinal		
20-inch .... *yd.*		.07½
30-inch		.13¾
40-inch		.15
50-inch		.24
Osnaburgs		
40-inch 2.34-yard .... *yd.*		.09¾
40-inch 2.48-yard		.09¼
40-inch 2.56-yard		.08
40-inch 3.00-yard		.07⅝
40-inch 7-ounce part waste		.07⅜
40-inch 10-ounce part waste		.10⅛
37-inch 2.42-yard		.09½
Raincoat Fabrics		
Cotton		
Bombazine 60 x 64 .... *yd.*		.07¼
Plaids 60 x 48		.10¼
Surface prints 60 x 64		.11½
Print cloth, 38½-inch, 60 x 64.		.04¾
Sheetings, 40-Inch		
48 x 48, 2.50-yard .... *yd.*		.07¾
64 x 68, 3.15-yard		.07
56 x 60, 3.60-yard		.05¾
44 x 40, 4.25-yard		.04⅞
Sheetings, 36-Inch		
48 x 48, 5.00-yard .... *yd.*		.04⅜
44 x 40, 6.15-yard		.03½
Tire Fabrics		
Builder		
17¼ ounce 60" 23/11 ply Karded peeler .... *lb.*		.28
Chafer		
14 ounce 60" 20/8 ply Karded peeler .... *lb.*		.28
9¼ ounce 60" 10/2 ply Karded peeler .... *lb.*		.27
Cord Fabrics		
23/5/3 Karded peeler, 1 1/16" cotton .... *lb.*		.28½
15/3/3 Karded peeler, 1 1/16" cotton .... *lb.*		.26½
12/4/2 Karded peeler, 1 1/16" cotton .... *lb.*		.25½
23/5/3 Karded peeler, 1¼" cotton .... *lb.*		.34
23/5/3 Combed Egyptian .... *lb.*		.47½
Leno Breaker		
8¼ ounce and 10¼ ounce 60" Karded peeler .... *lb.*		.30

Cotton for Rubber Goods

The importance of the Rubber Industry as a consumer of cotton is indicated by figures recently compiled by The Cotton-Textile Institute, Inc., 320 Broadway, New York, N. Y. During 1938 approximately 241,000,000 pounds of raw cotton were used in the manufacture of all types of rubber products, equivalent to 504,200 bales of raw cotton and representing approximately 8½% of the total cotton consumed in the United States. Tires consumed approximately 190,000,000 pounds, or the equivalent of 397,500 bales of raw cotton. Rubber and canvas footwear used approximately 11,000,000 pounds, or the equivalent of 23,000 bales. Other types of rubber products consumed approximately 40,000,000 pounds, or the equivalent of 83,700 bales, of raw cotton. In the manufacture of mechanical goods, as hose, belting, and matting, about 25,000,000 pounds, or the equivalent of 52,300 bales, of raw cotton were used; in rubberized fabrics, such as employed for raincoats, automobile top fabrics and tire covers, hospital sheeting, and rubberized fabrics for shoes, and to a smaller extent in the manufacture of heels and soles, approximately 15,000,000 pounds, or the equivalent of 31,400 bales, of raw cotton were consumed.

United States Latex Imports

Year	Pounds (d.r.c.)	Value
1937	51,934,040	$10,213,670
1938	26,606,048	4,147,318
1939		
Jan.	3,589,452	599,927
Feb.	3,844,996	657,565
Mar.	4,491,951	731,302
Apr.	2,279,171	360,739
May	6,240,019	1,067,682
June	4,111,994	694,863

Data from Leather and Rubber Division, United States Dept. of Commerce, Washington, D. C.

Tire Production Statistics

	Pneumatic Casings		
	Inventory	Production	Shipments
1937	10,383,235	53,309,973	53,485,388
1938	8,451,390	40,182,392	42,330,072
1939			
Jan.	8,932,245	4,581,380	4,163,005
Feb.	9,572,553	4,343,513	3,738,696
Mar.	10,108,584	5,137,030	4,582,655
Apr.	9,997,527	4,211,152	4,355,584
May	9,918,759	4,418,072	4,753,403
June	8,909,495	4,869,862	5,750,149
July	8,300,126	4,510,122	5,055,637

	Pneumatic Casings		
	Original Equipment	Replacement Sales	Export Sales
1937	22,352,601	29,886,326	1,246,461
1938	10,716,130	30,565,008	1,048,934
1939			
Jan.	1,685,190	2,353,822	123,993
Feb.	1,472,356	2,159,901	106,439
Mar.	1,746,999	2,719,450	116,206
Apr.	1,528,637	2,736,155	90,792
May	1,414,798	3,240,936	97,669
June	1,370,317	4,264,298	98,739
July	808,611	4,160,319	86,707

	Inner Tubes		
	Inventory	Production	Shipments
1937	10,311,745	52,373,330	52,766,728
1938	8,165,696	37,847,656	40,292,614
1939			
Jan.	8,068,700	4,097,759	3,935,652
Feb.	8,414,652	3,680,521	3,334,791
Mar.	8,900,944	4,470,184	4,015,333
Apr.	8,837,313	3,841,308	3,927,033
May	8,839,536	3,847,827	4,154,390
June	8,043,999	4,319,943	5,123,108
July	7,818,822	4,043,028	4,285,435

Source: The Rubber Manufacturers Association, Inc. Figures adjusted to represent 100% of the industry.

RECLAIMED RUBBER

United States Reclaimed Rubber Statistics—Long Tons

Year	Production	Consumption†	Consumption % to Crude	U. S. Stocks*	Exports
1937	185,033	162,000	29.8	28,800	13,233
1938	122,403	120,800	27.6	23,000	7,403
1939					
Jan.	14,826	13,743	29.7	23,334	748
Feb.	14,102	13,347	31.5	23,461	630
Mar.	15,647	16,197	32.3	22,155	756
Apr.	14,527	13,391	30.3	22.628	748
May	14,769	13,517	30.5	22,771	1,008
June	15,871	14,870	31.5	23,058	759
July	12,588	13,542	30.9	21,339	...

*Stocks on hand the last of the month or year. †Corrected to 100% from estimate of reported coverage.
Compiled by The Rubber Manufacturers Association, Inc.

According to R. M. A. figures, July reclaimed rubber consumption is estimated at 13,542 long tons, 8.9% lower than that of June; production at 12,588 long tons; and stocks on hand July 31, 21,339 long tons, the lowest this year and represent only 1½ months' supply based on consumption for the previous three months. It is interesting to note the extent that reclaimed rubber use in relation to crude rubber consumption is increasing this year; the percentage of reclaimed to crude consumption for the first seven months of this year is 30.2%, against 25.0% during the like period of 1938. The demand during August continued active, with most lines of rubber manufacturing absorbing large amounts of reclaim.

With prices of all grades of reclaim holding steady at last month's quotations, the market continues steady.

New York Quotations

August 24, 1939

	Sp. Grav.	¢ per lb.
Auto Tire		
Black Select	1.16-1.18	6 / 6¼
Acid	1.18-1.22	7 / 7¼
Shoe		
Standard	1.56-1.60	6½/ 6¾
Tubes		
No. 1 Floating	1.00	12 /12¼
Compound	1.10-1.20	8 / 8¼
Red Tube	1.15-1.30	8 / 8½
Miscellaneous		
Mechanical Blends	1.25-1.50	4½/ 5
White	1.35-1.50	11½/12

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

RUBBER SCRAP

The demand for scrap rubber during August was reported good. This activity is expected to hold for several months to come, barring the development of unfavorable circumstances arising from the present European situation.

The market is steady, and all grades of scrap remain at last month's levels.

CONSUMERS' BUYING PRICES

(Carload Lots for August 24, 1939)

		Prices
Boots and Shoes		
Boots and shoes, black	*lb.*	$0.01 /$0.01⅛
Colored	*lb.*	.00¾/ .00⅞
Untrimmed arctics	*lb.*	.00¼/ .00⅞
Inner Tubes		
No. 1, floating	*lb.*	.08½/ .09
No. 2, compound	*lb.*	.03¾/ .03⅞
Red	*lb.*	.03½/ .03¾
Mixed tubes	*lb.*	.03½/ .03⅝
Tires (Akron District)		
Pneumatic Standard		
Mixed auto tires with beads	*ton*	11.50 /12.00
Beadless	*ton*	15.00 /16.00
Auto tire carcass	*ton*	20.00 /22.00
Black auto peelings	*ton*	22.00 /23.00
Solid		
Clean mixed truck	*ton*	27.00 /28.00
Light gravity	*ton*	35.00 /36.00
Mechanicals		
Mixed black scrap	*ton*	20.00 /22.00
Hose, air brake	*ton*	20.00 /22.50
Garden, rubber covered	*ton*	10.00 /12.50
Steam and water, soft	*ton*	10.00 /12.50
No. 1 red	*lb.*	.02½/ .02¾
No. 2 red	*lb.*	.02¼/ .02½
White druggists' sundries	*lb.*	.03¾/ .04
Mixed mechanicals	*lb.*	.02¼/ .02½
White mechanicals	*lb.*	.03⅝/ .03¾
Hard Rubber		
No. 1 hard rubber	*lb.*	.11 / .11½

NEW PUBLICATIONS

(*Continued from page 63*)

"More Information for Employes Regarding Their Company." Policyholders Service Bureau, Metropolitan Life Insurance Co., One Madison Ave., New York, N. Y. 53 pages. A first report on this subject dealt with the increasingly popular method of presenting annual reports of operations to employes in a simplified form. This second study now discusses the efforts many organizations are making to give their workers a wider general knowledge of company problems, plans, or policies. In the report such questions as "What do employes want to know about their company? What should they know? What are companies actually telling their employes? What are successful media for presenting this information?" are answered by the executives of 160 companies.

Coal Analyses Directories. Authentic data on the analyses of coal have been published in separate books, one for each coal District. These data, filed with the National Bituminous Coal Commission by the District Producers Boards, cover practically every size of coal produced by every shipping mine within each District. The handbooks, of a small handy size, are obtainable from National Coal Publications, 304 Law Bulletin Bldg., Pittsburgh, Pa. Prices for books covering Districts 1, 2, 3, 7, 8, 9, and 10 are $10 per copy and for books on other Districts, $5.

"Manhattan Rubber Products for Industry." Fourth Edition. Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. 56 pages. This condensed catalog of mechanical rubber goods places emphasis upon belting, hose, packing, molded goods, asbestos friction material, rubber roll coverings, tank linings, and abrasive wheels. Transmission belt engineering data and technical information on other products are included.

"List of Inspected Electrical Equipment." Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill. 430 pages. This list, revised semi-annually, includes all listings up to May 1, 1939. The equipment listed has been examined with reference to fire and accident hazards and for conformity with the provisions of the National Electrical Code applying to their installations and use.

BOOK REVIEWS

(*Continued from page 64*)

"Uses and Applications of Chemicals and Related Materials." Compiled and edited by Thomas C. Gregory. Founded on data published in the *Oil, Paint, and Drug Reporter.* Published by the Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. 1939. Cloth, 6 by 9 inches, 653 pages. Cross-reference index. Price $10.

This guide to the current industrial uses, potential applications, and sales possibilities of 5,167 substances in over 50 industries, including the rubber industry, is intended to provide sales executives, research directors, manufacturers, dealers, and all others interested in the uses of chemical products with an easily accessible source of information of much practical value. All uses are classified by industries arranged alphabetically. Both general and specific uses are included: the general classification indicates whether, for example, the material acts as reagent, intermediate, solvent, softener, plasticizer, filler, reenforcing agent, etc.; the specific classification gives the exact products in the manufacture of which the listed material plays a part. Most uses covered by effective patents, either U. S. or foreign, are so indicated by the appropriate patent number in parentheses. A cross-reference index shows under which of several names each material is listed.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)

Allow nine words for keyed address. *Replies forwarded without charge.*

SITUATIONS WANTED

RUBBER CHEMIST AND COMPOUNDER. THIRTEEN YEARS' experience with large company and one year with small company. Experienced in tires, tubes, and mechanical goods. M.S. from Massachusetts Institute of Technology. Desires permanent position. Address Box No. 18, care of INDIA RUBBER WORLD.

PACKING AND MECHANICAL SALES EXECUTIVE with good record factory and sales work in major rubber and asbestos manufactures. Packing specialist nation-wide acquaintance private brand trade. Can organize factory and sales on trade mark lines, packings all types. Recognized expert compressed asbestos sheet packings. Available 30 days. Address Box No. 21, care of INDIA RUBBER WORLD.

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$2,500 SALARIED POSITION $15,000
OUR SYSTEM OF SEARCHING OUT SALARIED POSITIONS, hiding your identity, increases your salary commensurate with training and experience. For valuable information write Rubber Department, EXECUTIVE'S PROMOTION SERVICE, Washington, D. C.

ASSISTANT SUPERINTENDENT—MAN THOROUGHLY FAMILiar with operating procedure in mechanical goods factory, manufacturing hose, belts. In reply, state experience in detail, references, and salary expected. Address Box No. 16, care of INDIA RUBBER WORLD.

SALESMAN DESIRED BY OLD ESTABLISHED MECHANICAL rubber manufacturer. One acquainted with New York metropolitan district. Commission basis. Address Box No. 19, care of INDIA RUBBER WORLD.

FOREMAN—THOROUGHLY EXPERIENCED MOLDED AND EXtruded rubber products to take charge of production. State experience, age, and salary. Address Box No. 20, care of INDIA RUBBER WORLD.

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Chemists—Engineers
Every form of Chemical Service
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CUSTOM MILLING—EXPERT COMPOUNDING AND PROCESSING work for all requirements. The Honey Company, P. O. Box 453, Trenton, N. J.

SMALL EXTRUDING PLANT WANTS TUBE PRODUCTION work. What have you? Mutual Rubber Company, Alliance, O.

WANTED: SMALL RUBBER FACTORY EQUIPPED TO PRODUCE special molded items, preferably within 100 miles of New York City. Address P. O. Box 241, Brooklyn, N. Y.

CONTRACT MOLDING
We have forty hydraulic presses and labor available to do all types of rubber molding on cost plus basis. For further details write: CLIMAX RUBBER COMPANY, 274 Ten Eyck St., Brooklyn, N. Y.

SPONGE RUBBER
Complete formulas and manufacturing data with costs of one of the best and most complete lines of German-type sponge rubber ever manufactured and sold in this country—thoroughly developed and proved—are for sale. Will sell outright for exclusive use; or will sell on a non-exclusive basis to those interested in diversifying their line without other experimental cost. This is an opportunity. Address Box No. 17, care of INDIA RUBBER WORLD.

—AGENCY WANTED—
Business established fifteen years on Pacific Coast desires to acquire agency for West Coast covering items used by the Rubber Industry. Address The Desser Tire & Rubber Company, Huntington Park, Calif.

Compounding Ingredients for Rubber
by the Editors of
INDIA RUBBER WORLD
$2.50 Postpaid in U. S. A. $2.75 Elsewhere

MECHANICAL
MOLDED RUBBER GOODS
Sponge Rubber: Sheeted—Die Cut—Molded
We Solicit Your Inquiries
THE BARR RUBBER PRODUCTS COMPANY
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GUAYULE RUBBER
Washed and Dry, Ready for Compounding
PLANTATION RUBBER
From Our Own Estates in Sumatra
CONTINENTAL RUBBER COMPANY OF NEW YORK
745 Fifth Avenue New York

AN APPROVED CLAY
CROWN CLAY
SOUTHEASTERN CLAY COMPANY
AIKEN, SOUTH CAROLINA

(*Advertisements continued on page 77*)

British Malaya

An official cable from Singapore to the Malayan Information Agency, Malaya House, 57 Trafalgar Sq., London, W.C.2, England, gives the following figures for July, 1939:

Rubber Gross Exports: Ocean Shipments from Singapore, Penang, Malacca, and Port Swettenham.

To	Sheet and Crepe Rubber Tons	Latex, Concentrated Latex, Revertex, and Other Forms of Latex Tons
United Kingdom	6,774	543
United States	21,665	1,404
Continent of Europe	6,104	314
British possessions	5,970	97
Japan	1,918	18
Other countries	1,137	18
Totals	43,568	2,394

Rubber Imports: Actual, by Land and Sea

From	Dry Rubber Tons	Wet Rubber (Dry Weight) Tons
Sumatra	7,897	117
Dutch Borneo	1,980	...
Java and other Dutch islands	370	...
Sarawak	2,734	5
British Borneo	574	48
Burma	305	1
Siam	4,208	1,244
French Indo-China	306	144
Other countries	104	15
Totals	18,478	1,574

Rubber and Canvas Footwear Production Statistics

	Thousands of Pairs		
	Inventory	Production	Shipments
1937	20,430	74,102	67,191
1938	16,183	50,812	54,942
1939			
Jan.	16,157	4,807	4,778
Feb.	16,582	4,953	4,629
Mar.	17,281	5,897	5,214
Apr.	18,083	5,216	4,414
May	19,055	5,033	4,017
June	19,729	4,866	4,192

The above figures have been adjusted to represent 100% of the industry based on reports received which represented 81% for 1936-37.

Source: *Survey of Current Business*, Bureau of Foreign & Domestic Commerce, Washington, D. C.

"Inspected Gas, Oil, and Miscellaneous Appliances." June, 1939. Supplement to December, 1938, List. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill. 24 pages. This supplement contains only listings established subsequent to the publication of the December, 1938, list, which also must be consulted.

New York Quotations

(*Continued from page 70*)

Softeners (*Cont'd*)

Palm oil (Witco), c.l.	*lb.*	$0.0575
Pine tar	***gal.***	
Plastogen	*lb.*	.0775/$0.12
R-19 Resin (drums)	***lb.***	**.10**
R-21 Resin (drums)	***lb.***	**.10**
Reogen	*lb.*	.115 / .26
Rosin oil, compounded	***gal.***	**.40**
RPA No. 1	*lb.*	.65
2	*lb.*	.65
3	*lb.*	.46
Rubtack	***lb.***	**.10**
Tackol	*lb.*	.085 / .18
Tonox	*lb.*	.52 / .61
Tonox D	*lb.*	.75 / .85
Witco No. 20	*gal.*	.20
X-1 Resinous oil (tank car)	*lb.*	.019

Solvents

Beta-Trichlorethane	***gal.***	
Carbon bisulphide	***lb.***	
tetrachloride	***lb.***	
Industrial 90% benzol (tank car)	***gal.***	**.16**
Skellysolve	***gal.***	

Stabilizers for Cure

Laurex, ton lots	*lb.*	.105 / .13
Stearex B	*lb.*	.10 / .11
Beads	*lb.*	.085 / .095
Stearic acid, single pressed	*lb.*	.10 / .11
Stearite	***100 lbs.***	9.00
Zinc stearate	***lb.***	**.23**

Synthetic Rubber

Neoprene Type E	***lb.***	**.65**
G	***lb.***	**.70**
GW	*lb.*	.75
H	***lb.***	**.78**
M	***lb.***	**.65**
Latex Type 57	***lb.***	**.30**

Varnish

Shoe	***gal.***	**1.45**

Vulcanizing Ingredients

Sulphur		
Chloride, drums	*lb.*	.035 / .04
Rubber	*100 lbs.*	2.00
Telloy	*lb.*	1.75
Vandex	*lb.*	1.75
(See also Colors—Antimony)		

Waxes

Carnauba, No. 3 chalky	***lb.***	**.37½**
2 N.C.	***lb.***	**.39½**
3 N.C.	*lb.*	.37½
1 Yellow	***lb.***	**.4575**
2	***lb.***	**.4425**
Montan, crude	***lb.***	**.11**

U. S. Crude and Waste Rubber Imports for 1939

	Plantations	Latex	Paras	Africans	Centrals	Guayule	Totals 1939	Totals 1938	Balata	Miscellaneous	Waste
Jan. ....*tons*	36,672	1,521	560	56	9	264	39,082	42,135	61	803	328
Feb.	34,185	1,463	239	348	3	252	36,490	43,930	45	685	54
Mar.	36,434	1,885	229	208	4	229	38,989	35,967	33	649	29
Apr.	27,991	784	487	142	1	196	29,601	30,807	65	275	246
May	44,015	2,167	413	761	7	172	47,535	27,410	78	759	151
June	33,956	1,489	318	42	3	139	35,947	26,011	107	680	7
July	33,211	2,511	456	292	..	269	36,739	22,918	46	884	104
Total 7 mos., 1939 .....*tons*	246,464	11,820	2,702	1,849	27	1,521	264,383	....	435	4,735	919
Total 7 mos., 1938 .....*tons*	218,358	6,202	1,838	1,043	17	1,720	....	229,178	310	5,311	196

Compiled from The Rubber Manufacturers Association, Inc., statistics.

World Net Imports of Crude Rubber

Year	U.S.A.	U.K.†	Argentine	Australia	Belgium	Canada	France	Greater Germany‡	Italy	Japan	Poland	Sweden	U.S.S.R.	Rest of the World	Total
1937	592,500	135,900	9,500	19,300	15,000	36,100	60,000	115,000	24,000	62,200	6,100	6,700	30,400	52,700	1,120,500
1938	406,330	168,283	7,653	12,309	11,310	25,696	58,148	107,917	28,170	46,307	7,849	8,304	26,219*	49,047	927,215
1939															
Jan.	36,614	7,121	417	954	898	2,867	4,694	9,095	2,133	2,553	665	643	4,000*	4,196	70,565
Feb.	30,578	8,087	1,092	1,785	1,068	1,451	5,327	8,348	2,025	3,263	709	467	1,000*	4,629	66,515
Mar.	45,286	12,092	440	1,324	1,242	2,458	4,503	9,028	1,525	4,019	985	581	2,000*	4,810	86,283
Apr.	31,590	7,129	786	1,138	855	1,466	5,650	9,316	1,926	3,579	673	994	2,000*	4,465	69,190
May	45,390	10,488	600*	1,202	792	3,006	4,646	9,032	1,573	4,438	940	1,047	1,000*	5,611	86,807

*Estimated. †U. K. figures show gross imports, not net imports. ‡Including imports of Austria and Czechoslovakia. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Shipments of Crude Rubber from Producing Countries

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Thailand	French Indo-China	Total	Philippines and Oceania	Liberia†	Other Africa	South America	Mexican Guayule	Grand Total
1937	469,900	431,700	70,400	9,800	7,200	13,200	25,900	35,600	43,400	1,107,100	1,600*	2,300	9,100	16,300	3,400	1,139,800
1938	372,046	298,101	49,528	8,459	6,737	9,512	17,792	41,618	59,156	862,949	1,971*	2,929	9,000*	15,337	2,758	894,944
1939																
Jan.	24,393	38,678	7,237	764	1,115	1,604	2,342	2,918	4,739	83,790	220	528	800	1,812	347	87,497
Feb.	29,278	24,996	5,495	947	618	664	1,484	5,606	5,659	74,747	158	435	800	1,187	319	77,646
Mar.	29.298	27,934	3,718	774	619	344	1,177	5,401	4,636	73,901	230	427	800	1,407	274†	77,039
Apr.	29.779	28,341	2.225	881	379	1,687	2,446	2,600	2,581	70,979	135	533	800	1,206	212†	73,865
May	29,598	24,429	2,805	1,002	668	558	1,649	2,782	4,585	68,076	129	250*	800	1,077	158†	70,490
June	22,052	27,959	3,641	647	805	332	1,157	1,748	4,630	62,971	200*	250*	800	676	250*	65,147

*Estimated. †Guayule rubber imports into U.S.A. and Germany provisional until export figures from Mexico are received. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Classified Advertisements

Continued

MACHINERY AND SUPPLIES FOR SALE

United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	June, 1939		Six Months Ended June, 1939	
	Quantity	Value	Quantity	Value
UNMANUFACTURED—*Free*				
Liquid latex (solids) ..... *lb.*	4,111,994	$694,863	24,557,583	$4,112,078
Jelutong or pontianak .... *lb.*	1,337,711	122,087	7,877,350	825,447
Balata .... *lb.*	267,012	33,876	726,273	98,463
Gutta percha .... *lb.*	271,521	45,254	1,517,491	233,565
Guayule .... *lb.*	203,600	19,879	2,320,200	202,486
Scrap and reclaimed ..... *lb.*	867,984	11,567	5,463,739	101,654
Totals	7,059,822	$927,526	42,462,636	$5,573,633
Misc. rubber (above), 1,000 *lbs.*	7,060	$927,526	42,462	$5,573,633
Crude rubber ...... 1,000 *lbs.*	72,658	11,403,150	479,640	74,488,317
Totals .... 1,000 *lbs.*	79,718	$12,330,676	522,102	$80,061,950
Chicle, crude .... *lb.*	662,916	$241,911	10,847,954	$3,788,448
MANUFACTURED—*Dutiable*				
Rubber tires .... *no.*	3,159	$21,372	12,412	$64,355
Rubber boots, shoes, and overshoes .... *prs.*	1,951	466	5,658	2,032
Rubber soled footwear with fabric uppers .... *prs.*	83,844	16,821	396,545	75,171
Golf balls .... *no.*	48,468	5,523	436,853	44,043
Lawn tennis balls .... *no.*	168,012	19,469	914,380	96,603
Other rubber balls .... *no.*	331,103	7,644	1,826,591	68,370
Other rubber toys .... *lb.*	14,556	2,357	154,751	25,069
Hard rubber combs ...... *no.*	5,328	427	457,569	34,099
Other manufactures of hard rubber	......	1,455	......	14,510
Friction or insulating tape .*lb.*	7,308	1,668	95,792	17,619
Belts, hose, packing, and insulating material	......	8,492	......	37,550
Druggists' sundries of soft rubber	......	7,583	......	33,247
Inflatable swimming belts, floats, etc. .... *no.*	55,788	3,425	499,221	31,695
Other rubber and gutta percha manufactures ... *lb.*	81,250	19,948	713,288	352,741
Totals	......	$116,650	......	$897,104

Exports of Foreign Merchandise

	June, 1939		Six Months Ended June, 1939	
RUBBER AND MANUFACTURES				
Crude rubber .... *lb.*	924,552	$147,910	6,084,787	$968,700
Balata .... *lb.*	5,467	650	29,215	7,365
Other rubber, rubber substitutes and scrap .... *lb.*	......	......	139,355	8,47?
Rubber manufactures (including toys)	......	966	......	11,700
Totals	......	$149,526	......	$996,237

Exports of Domestic Merchandise

	June, 1939		Six Months Ended June, 1939	
RUBBER AND MANUFACTURES				
Reclaimed .... *lb.*	1,698,962	$83,131	10,413,187	$524,569
Scrap .... *lb.*	8,345,469	151,583	51,969,897	797,815
Cements .... *gal.*	48,208	57,782	260,942	322,822
Rubberized auto cloth .*sq. yd.*	19,444	9,918	87,037	45,278
Other rubberized piece goods and hospital sheeting .. *sq. yd.*	290,955	110,668	1,457,600	548,992
Boots .... *prs.*	4,670	10,947	44,396	99,468
Shoes .... *prs.*	12,798	6,860	107,353	51,492
Canvas shoes with rubber soles .... *prs.*	45,572	37,002	337,114	230,809
Soles .... *doz. prs.*	3,597	9,461	23,223	48,513
Heels .... *doz. prs.*	26,738	19,770	242,911	131,692
Soling and top lift sheets .*lb.*	48,640	13,436	333,307	67,834
Gloves and mittens .. *doz. prs.*	10,989	23,114	51,857	112,643
Water bottles and fountain syringes .... *no.*	16,193	6,267	116,694	41,995
Other druggists' sundries ...	......	54,984	......	311,638
Gum rubber clothing .... *doz.*	28,776	42,952	164,549	347,654
Balloons .... *gross*	34,196	28,345	207,387	155,768
Toys and balls	......	22,152	......	81,798
Bathing caps .... *doz.*	3,225	7,002	33,011	67,100
Bands .... *lb.*	31,763	13,277	141,633	58,763
Erasers .... *lb.*	31,363	17,989	151,922	81,405
Hard rubber goods				
Electrical battery boxes .*no.*	12,135	9,609	89,852	66,680
Other electrical .... *lb.*	15,751	4,948	133,891	39,104
Combs, finished ...... *doz.*	17,565	11,711	89,987	46,992
Other hard rubber goods	......	11,921	......	78,542
Tires				
Truck and bus casings .*no.*	27,905	539,841	153,976	2,988,333
Other auto casings .... *no.*	72,409	595,731	384,853	4,019,425
Tubes, auto .... *no.*	58,387	99,953	371,713	585,289
Other casings and tubes .. *no.*	15,726	132,380	67,435	506,463
Solid tires for automobiles and motor trucks .... *no.*	252	4,413	1,735	18,965
Other solid tires .... *lb.*	26,358	4,789	105,224	20,863
Tire sundries and repair materials .... *lb.*	369,018	98,656	1,277,886	364,087
Rubber and friction tape .. *lb.*	56,457	17,124	329,393	95,871
Fan belts for automobiles .*lb.*	59,842	28,866	319,439	181,154
Other rubber and balata belts .... *lb.*	227,652	131,517	1,496,532	814,129
Garden hose .... *lb.*	126,237	36,962	533,581	114,484
Other hose and tubing .... *lb.*	652,166	270,893	2,832,015	1,072,508
Packing .... *lb.*	92,578	48,852	618,162	278,422
Mats, matting, flooring, and tiling .... *lb.*	124,728	16,845	668,173	105,150
Thread .... *lb.*	45,941	44,234	346,048	308,552
Gutta percha manufactures .*lb.*	44,027	13,110	700,249	205,393
Other rubber manufactures ..	......	157,139	......	748,360
Totals	......	$3,006,134	......	$16,786,814

Imports by Customs Districts

	June, 1939 *Crude Rubber		June, 1938 *Crude Rubber	
	Pounds	Value	Pounds	Value
Maine and New Hampshire.	78,448	$13,248	......	......
Massachusetts	11,332,444	1,830,893	6,066,154	$796,743
Buffalo	......	......	112,000	11,356
New York	47,221,600	7,508,975	44,669,649	5,469,407
Philadelphia	1,202,800	194,725	1,429,306	146,659
Maryland	1,880,292	272,850	894,052	98,284
Georgia	669,863	97,395	......	......
Mobile	4,368,930	606,775	112,000	12,403
New Orleans	3,769,129	575,738	4,799,665	618,698
Galveston	67,200	10,390	......	......
El Paso	89,600	8,798	......	......
Los Angeles	5,727,930	913,005	1,177,645	141,682
San Francisco	369,730	56,576	833,783	110,721
Chicago	......	......	501	100
Oregon	16,800	2,662	......	......
Colorado	179,200	25,862	......	......
Totals	76,973,966	$12,117,892	60,094,755	$7,406,053

*Crude rubber including latex dry rubber content.

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House, New York, N. Y.

No.	COMMODITY	CITY AND COUNTRY
*2859	Rubber goods	Athens, Greece
†2860	Storage batteries	Bombay, India
*2903	Rubber shoes	Teheran, Iran
¶2905	Household rubber goods, sport goods, toys, and novelties	Zurich, Switzerland
*2906	Baby pants, aprons, raincoats, hat covers, etc.	Mexico City, Mexico
†2907	Bathing caps and beach novelties	Brussels, Belgium
¶2918	Druggists' sundries	Winnipeg, Canada
†2924	Boots	Teheran, Iran
‡2927	Druggists' sundries	Manila, Philippine Islands
†2958	Machines to make elastic knee caps	Warsaw, Poland
*2982	Rubber boots	Oporto, Portugal
*2991	Sporting goods	Johannesburg, South Africa
*3013	Druggists' sundries	Alexandria, Egypt
§3020	Insulated cables and wires	Buenos Aires, Argentina
*3049	Shoe soles and heels	Cairo, Egypt
*3061	Canvas and rubber shoes	London, England
†3071	Machines for printing on rubber balloons	Lille, France
†3088	Storage batteries	Amsterdam, Netherlands
†3089	Hot-water and ice bags	Lisbon, Portugal
†3090	Druggists' and surgical rubber goods	Salonika, Greece
*3101	Erasers	Mexico City, Mexico
*3102	Balloons, aprons, raincoats, and rubberized fabrics	Mexico City, Mexico
†3104	Hockey balls	The Hague, Netherlands
†3106	Dental vulcanizers	Batavia, Java
*3155	Elastic material for corsets, garters, and suspenders	Lima, Peru
†3207	Heels, soles, and anti-slip articles	Amsterdam, Netherlands
†3217	Automobile-tire-plant machinery	Rotterdam, Netherlands
‡3229	Hospital sheeting	Calcutta, India
*3231	Druggists' sundries	Shanghai, China
¶3243	Hard rubber articles	Paris, France
*3268	Rubber belting for machinery	Cairo, Egypt
*3282	Rubber goods and vulcanizers	Cairo, Egypt
†3283	Storage batteries and tires	Habana, Cuba
‡3309	Latex rubber sundries	Salonika, Greece
*3359	Suspenders	Alexandria, Egypt
*3365	Raincoats, rubber shoes, etc.	Manila, Philippine Islands

*Agency. †Purchase. ‡Purchase and agency. ¶Purchase or agency. §Exclusive agency.

Rubber Trade Inquiries

The inquiries that follow have already been answered; nevertheless they are of interest not only in showing the needs of the trade, but because of the possibility that additional information may be furnished by those who read them. The Editor is therefore glad to have those interested communicate with him.

No.	INQUIRY
2667	Manufacturer of "Ali" prophylactics.
2668	Supplier of unvulcanized compounds for jewelry and denture molds.
2669	Who can produce a cylindrical molded article with a bottom, of latex or sponge rubber, 6 inches high, 2⅝ inches in diameter, and ¼-inch thick.
2670	Suppliers of sound producers for rubber toys.
2671	Manufacturers of steel wires for bicycle tires and metal valves for bicycle tubes.
2672	Manufacturers of mats for golf practice devices.
2673	Suppliers of China wood oil.
2674	Manufacturers of adhesives to bond permanently burlap or cotton fabrics to wood or concrete floors.
2675	Manufacturers of bathing cap molds.
2676	Manufacturers of rubber tubing.
2677	Manufacturer of soapstone puffer.
2678	Manufacturers of inflated rubber balls.
2679	Manufacturer of "New Form" ("Pneuform"), inflatable dressmaking form.

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